THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. XCII. No. 2219.] LONDON, NOVEMBER 21, 1905. [57TH YEAR. PRICE 6d.

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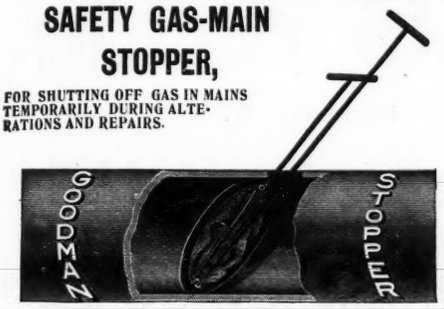

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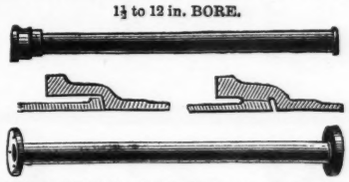

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Fuel used from Dec. 9 to Dec. 16: Coke	£	s.	d.
dust—41 tons 4 cwt., at 1s. 11d. .	3	19	0
Washed slack—15 tons 17 cwt., at 6s. 6d.	5	3	2
	£9	2	2

This works out at a fraction under 2s. 4d. per 1000 gallons. Can this result be beaten? I may add that the water-feed to the boilers is heated by the exhaust steam from the engines to 200 deg.

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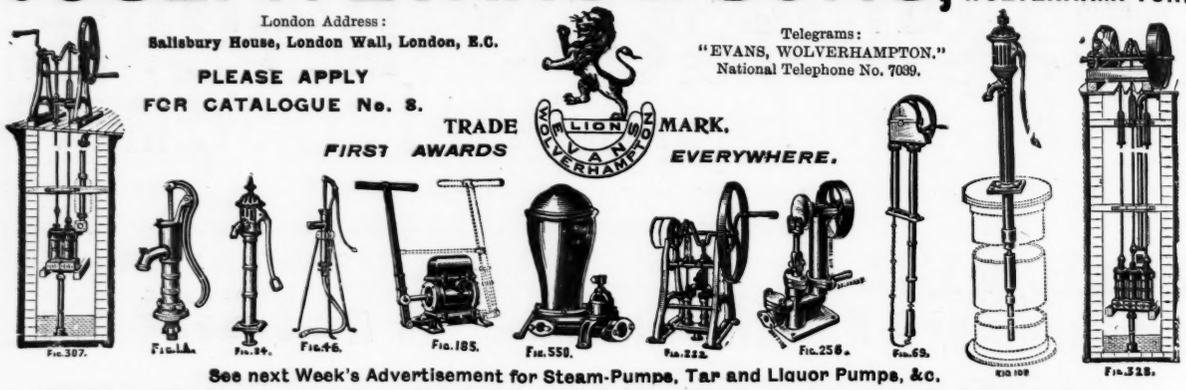

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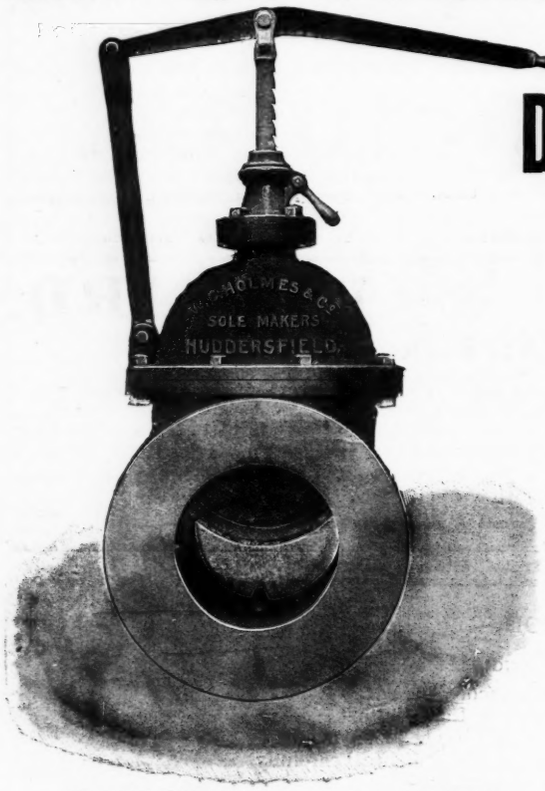

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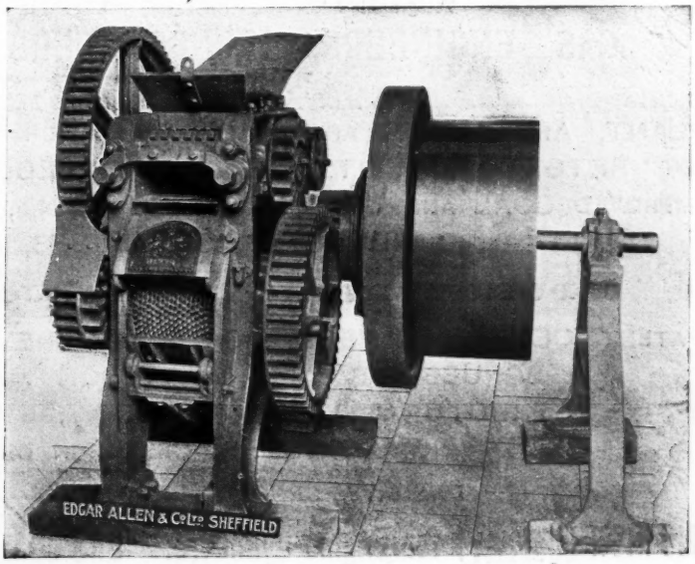

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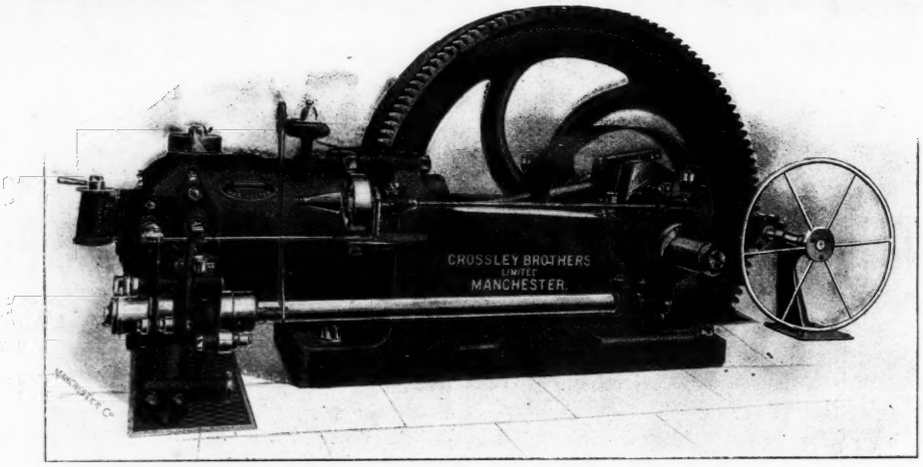

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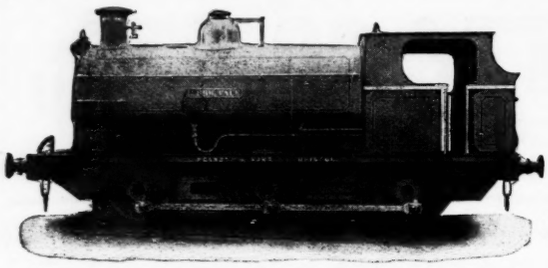

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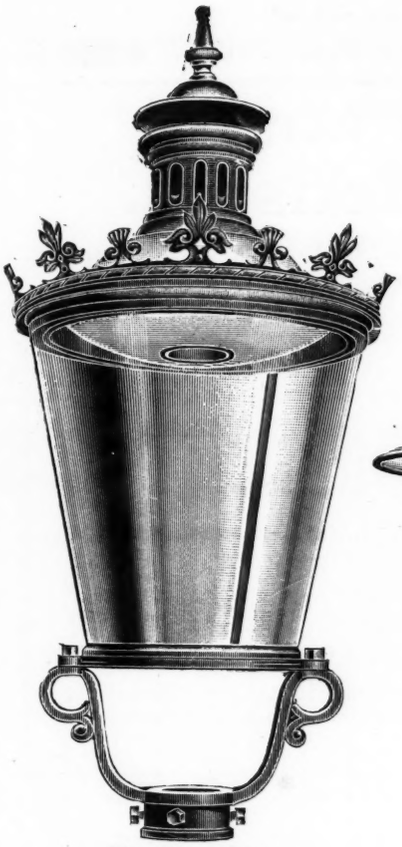

Fig. 35. 100 c.p.

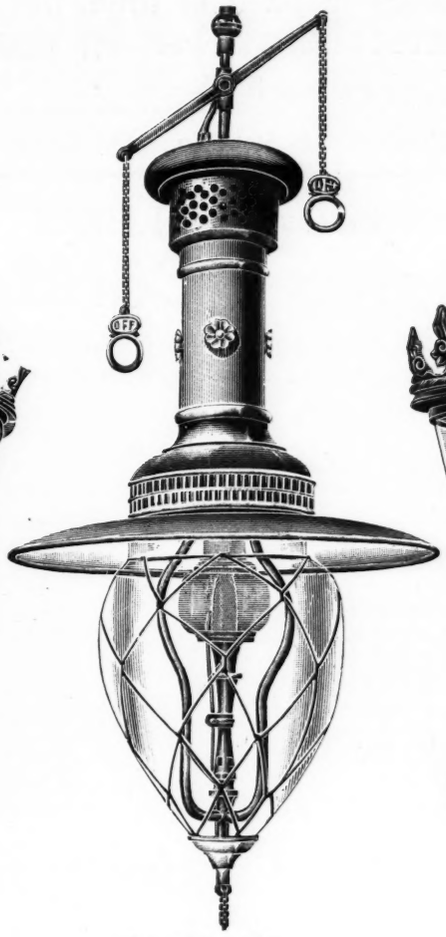

Fig. 607. 600 c.p.
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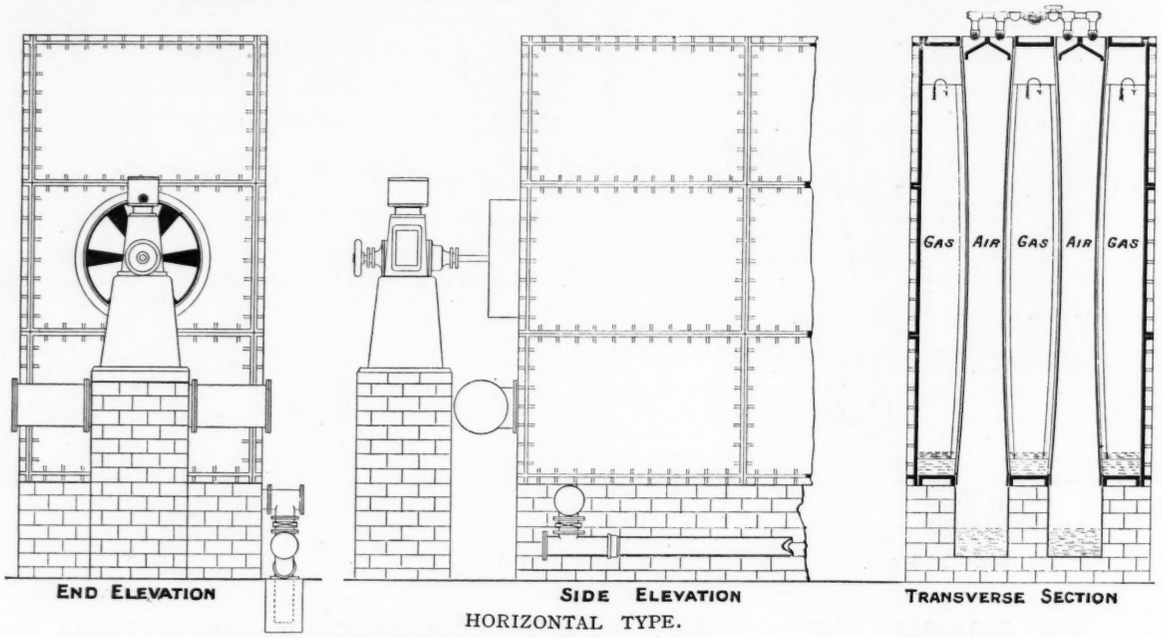

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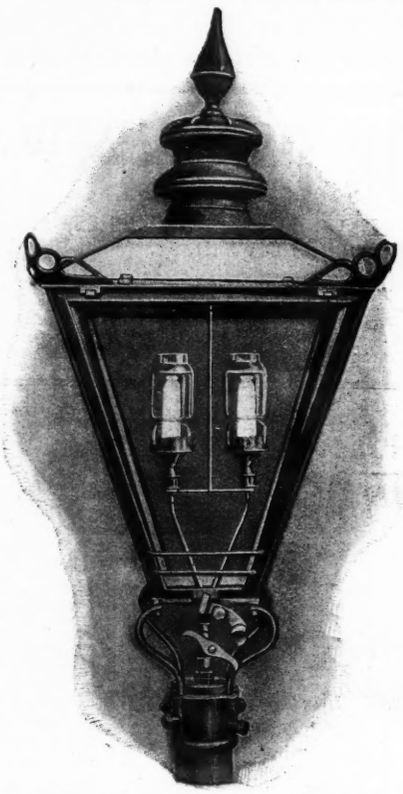

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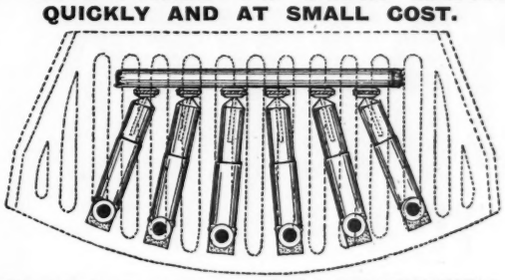

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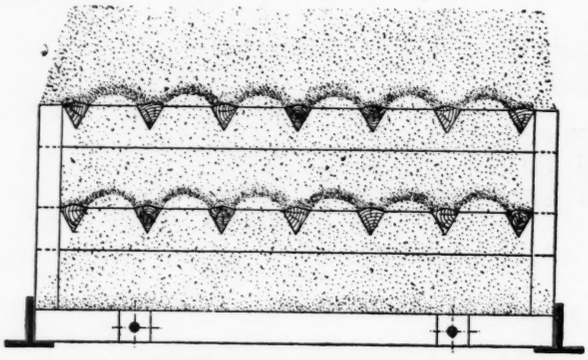

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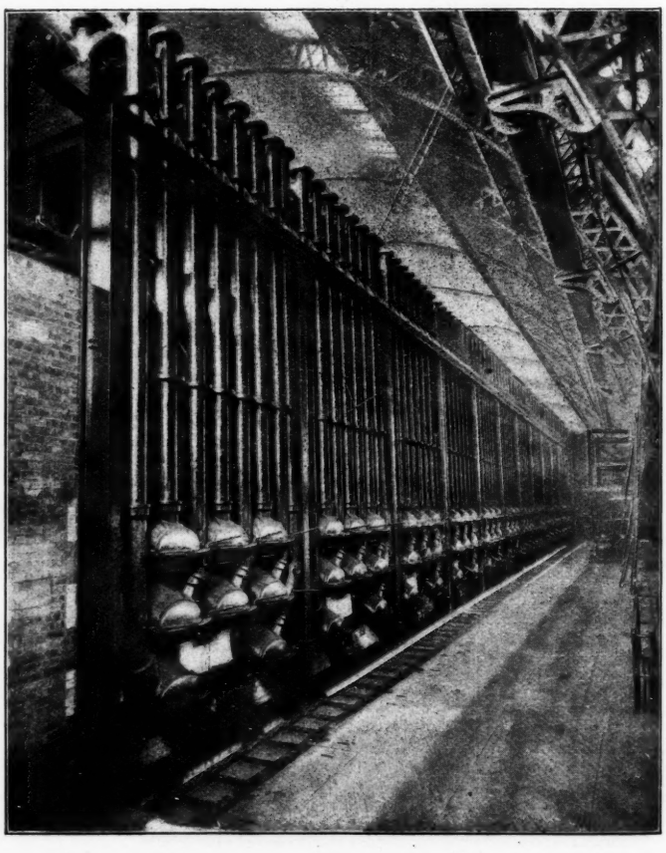

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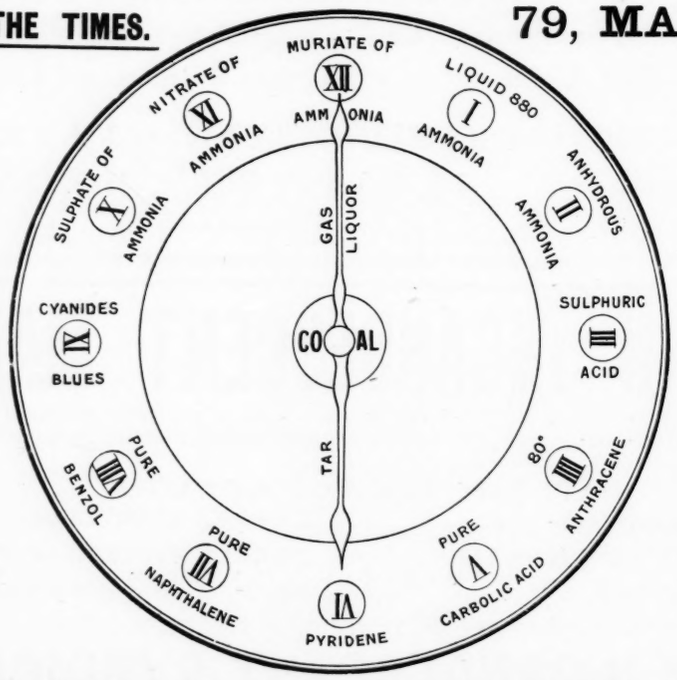

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Wilton's Patent Neutralizing Apparatus for the Waste Gases from Sulphate of Ammonia Plant.

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EDITORIAL NOTES—GAS, &c.

Railway Waggons on Private Lines and Sidings.

IT is satisfactory to know that this very important matter has aroused general attention, and that there is every reason for anticipating a goodly show of representatives of gas-works undertakings at Caxton Hall to-morrow, when will be commenced the inquiry into the objections which have been lodged to the proposed regulations. We understand that these form a good-sized volume, and have been sent from all parts of the kingdom, and represent practically every industry employing private sidings. As was reported in last week's issue, combined action is being taken by the Scottish gas undertakings, upon the prompt and timely initiative of Mr. W. R. Herring, of Edinburgh. This course has also been determined upon by some of the principal Suburban companies; others having elected to appear separately. It is needless to say that the Metropolitan Companies are in the forefront in the ranks of the objectors. Some doubt exists as to the intentions of various English undertakings, but it is understood that communications have lately passed between some of the principal of them, with the object of securing combined representation. As appeared from the remarks of Mr. Milne at the Edinburgh meeting, nothing has been heard of the matter at Manchester, which seems to point to an unaccountable omission on the part of the Home Office; while, strange to say, from Birmingham no objection has been lodged. Still more strange to relate, report has it that the only reply given to the Home Office on behalf of Birmingham, under the signature of Mr. E. O. Smith, the Town Clerk, relates to the electric light undertaking of the city! It sounds incredible that such a reply should be given on such a subject on behalf of a Corporation owning a gas undertaking consuming some half million tons annually of rail-borne coal, and having a network of private sidings. It is much to be hoped, however, that Birmingham will yet be in the ranks of the objectors to-morrow. We understand that the Council of the Institution of Gas Engineers have decided to appear by Counsel at the inquiry, on behalf of the gas industry generally. This action will doubtless commend itself to the members, as an indication that the Council are watchful over the interests that are entrusted to their care.

The Society of British Gas Industries.

THE interest of all concerned in the contracting and plant and appliance manufacturing work of the gas industry is specially asked for the meeting that is to be held at the Holborn Restaurant next Thursday. It is particularly hoped that this meeting will be well attended, in order that there may be complete consideration, and definite action upon, the report and the draft of the objects and rules that are unanimously presented for adoption by the Committee to whom was delegated the task of examining the whole question and giving (as they have done) compendious form to the purposes of the proposed Society. The Committee have devoted considerable time to the matter, and have thoroughly weighed the arguments *pro* and *con;* the result being the concrete proposal for the formation of a Society. It will be ill-recompense for their labour if there is not a large and representative gathering to show appreciation of what they have done. There is not the slightest doubt, if the decision on Thursday is favourable to the starting of the Society, that then the membership will quickly swell; but it would be a great satisfaction, and it would be a compliment to the Committee, to have a commencement that could be looked back upon with pride. It must not be forgotten, however, that from small beginnings some of our most flourishing Associations have grown. So that, if in the event—anticipating a favourable decision—there should only be a small membership at the commencement, it will not, precedent shows, be any criterion as to future success or otherwise. If there are any who are eligible who cannot attend the meeting, they have before them the proposed objects and rules; and an intimation by Thursday morning to Mr. Charles Clare of their willingness to become members if the Society is started would be very useful. A year ago next Thursday, the magnificent Gas Exhibition at Earl's Court had been running for four days only. From the very outset to its closing day the exhibition was a success. It was a wonderful illustration of the power of combined effort on the part of those who will be qualified for membership in the proposed Society. What was done at Earl's Court cannot have consummated the good of which the contractors to, and makers of plant and appliances for, the gas industry are capable by a perpetual unity. Therefore we hope that next Thursday there will be a representative meeting of principals of firms engaged in the gas industry, and that the anniversary of the Earl's Court Exhibition will be commemorated by the establishment of a Society which will cut out for itself a worthy place in the industry in which we are all proud to be working partners.

The Scientific Study of Fuels, including Gas Manufacture and Utilization.

THE announcement of the University of Leeds as to the appointment of Dr. W. A. Bone, F.R.S., as Professor of Applied Chemistry (Fuel and Metallurgy) is one which we cannot allow to pass without impressing its importance upon the gas industry, and earnestly soliciting, in connection with the work about to be undertaken, something of a more tangible nature than sympathetic approval, and an expression of willingness or tacit consent to participate in the benefits without bearing any of the burden. The appointment marks the first step in a long-cherished project—namely, that of doing something good at the Leeds University for the scientific study of fuel, and for coal gas and its cognates—their manufacture and uses—in particular. University study and education in this particular has been neglected, with the result that, in the application of fuels in the industrial world, rule-of-thumb and traditional methods have largely stood in the way of economical progress. If we look to the University of Leeds, we find there a very strong representation of Applied Science—civil, mechanical, and electrical engineering, mining, agriculture, dyeing, textile, and leather industries—but nothing on the same scale for fuel and its numerous problems. Therefore we heartily compliment the University on having for some time past recognized the want, and on, in so doing, having at length bestirred themselves to meet it. We know of no more fitting place than the Leeds University, nor one with greater opportunity or special advantages for undertaking this work. And, moreover, the gas industry has a link with this great scholastic centre in the person of Professor Arthur Smithells, whose devoted researches into the chemistry of flames and the combustion of gases have materially clarified and amplified our knowledge of these things. In the new work to which the University has opened its doors, its extension to the needs of the gas industry is largely due, if we are not mistaken, to this attachment of Professor Smithells to our industry. Anyway, we have in his past interest in matters relating to the use of coal gas, a present guarantee of the real earnestness of the University to bring about, through the teachings of Dr. Bone, a greater knowledge of fuels of

all kinds, and the application of Science to their practical utilization.

There have been two difficulties in the way of an earlier starting of this project. The one has been the usual lack of money, and the other the difficulty of finding the right man. But at length the University have the means of making a modest start, and have procured a Professor who, we have every confidence in asserting, is well qualified to do successfully the duty with which he is to be entrusted. In putting forth the statement as to the means available being sufficient for the inception of the work, the word "modest" ought to be distinctly underlined, as we are particularly anxious that the gas industry should not forfeit, by negligence, a continuance of consideration in connection with this matter in conjunction with those other fuel-using industries that will profit by this fresh departure of the University of Leeds. As to Dr. Bone, the announcement we publish elsewhere contains the credentials which stamp the choice of the University a wise one. The excellent work that Dr. Bone has done in investigating combustion phenomena is common knowledge, and in recognition of this work he last year had conferred upon him the much-coveted distinction of being elected a Fellow of the Royal Society. It may not, however, be so generally known that he has spent much time in investigating fuel problems on a large scale; and there is no doubt he is singularly qualified to take up the scientific problems connected with the gas industry, and train other people to a knowledge that should make them far more serviceable to the industry.

It is unnecessary to say more than we have done as to the importance of the work that is to be undertaken in the new department at the Leeds University. To those upon whom the technical responsibilities of the gas industry rest, there is no occasion to speak of the value of scientific knowledge in producing proper utilization, or of proper utilization as a potential factor in fuel conservation and profitable economy. Nor need we dwell upon the effect of a thorough understanding of our gaseous commodities in producing the best utilization, which must redound to the stability of the industry. Nor, again, need we stay to enlarge upon what must be patent to all—that the greater the propagation of scientific knowledge, the more scientific knowledge is practically applied, the greater the industrial progress. But there must be a few words on the scope of the fresh work the University have determined to prosecute. As already generally stated, it is intended to specialize the new department in the direction of fuel and its applications. Coal, coke, and gas are the fuels of the gas industry; and how largely these fuels will come within the purview of the department may be seen from two passages of the announcement emanating from the University:—

> Processes such as the coking of coal, the manufacture and uses of power gas, and the utilization of fuel of all kinds, have led to a great demand for scientific knowledge and research. It is also intended that the new department shall concern itself with the manufacture and use of coal gas, and that it shall, in fact, take its place as a School of Applied Chemistry in relation to fuel, side by side with the already existing departments of Applied Chemistry in relation to dyeing and to the leather industries.

It is not, of course, proposed to meet the requirements of those who are already engaged in the gas industry, and have little time to devote to study; but it is hoped that there will be found students who are prepared to give themselves a thorough scientific training in preparing for their future vocation in the industry. We recognize—as it is believed the gas industry as a whole will recognize—that the number of places where the highest education in relation to this as to any other particular industry can be really successfully developed, must be very limited; and therefore it is that we plead for the goodwill, the interest, and the support for this new and really needed undertaking of the Leeds University. We hope the gas industry and the profession will be found generously responsive.

The Function of a Gas Association.

Inequalities in condition—geographical, fundamental, and governmental—must always affect largely the point of view and the judgment on questions that are of common interest. This is to be recognized in reading the presidential address of Mr. E. F. Lloyd to the Michigan Gas Association, the greater portion of which is published in this issue. It was a thoughtful composition; and its theme is set forth in the above title. We in this country are somewhat at a disadvantage in discussing Mr. Lloyd's utterances, owing to the fact that he and his fellows live and have their being under conditions that are, down to their very root, different from what obtain in this country. Even if we essay to get on to common ground, the points of view must diverge; and, in the end, the respective extremities of vision may be found to be even further separated than was originally fancied to be the case. If this confession of inability to get thoroughly into accord with him in respect of a common standpoint is appreciated by Mr. Lloyd, he will quite understand that this allusion to his address is made in no arrogant spirit, but is simply a contribution to the subject he has raised in so far as principles and not conditions appear mutually applicable to the United States and the British Isles.

The proposition that Mr. Lloyd submits is in effect that the existing gas organizations of America do not, and are not, able or competent to meet the present necessities; that in their work they have become stereotyped and confined, through the slavish following of the working lines laid by the founders of the Gas Associations in days when circumstances were more lenient towards the industry. Inability or incompetence to meet the present necessities, depends upon what the latter are. It is manifest from what is found towards the latter part of the address, that the necessities of the gas interests of the State of Michigan are not necessities as we find them in this country; and we can only admit that any inability or incompetence that our own national gas organization suffers from in operating to the greater advantage of the gas industry, lies in the single want of funds. That is the curb to the spread of utility, and the sole block to the diversion of work into new channels. The original purpose of these organizations did not extend beyond the technical and the scientific; but they have deviated from that to the extent of giving opportunity to members for taking counsel together on questions of commercial importance. If we look to the published records of the various American Associations, they show that, if anything, the spheres of their activity exceed those on this side. Therefore the charge of work having fallen into a state of inflexibility, can hardly be maintained by the facts. Assuming, however, that Mr. Lloyd really has good cause for his criticism of the organized effort of America, the question immediately arises as to the manner of improvement. The suggestion of a National Gas Association for America that shall combine the whole of the States and, as we understand it, make the existing Associations sections of the national body, does not seem to appeal to Mr. Lloyd. Even as between one State and another, Mr. Lloyd finds that geographical, fundamental, and governmental conditions are a barrier to anything useful emerging from a body of a national character; and he thinks that, with an extension of its composition and duties, the Michigan Association could run very well alone, and labour most usefully outside the course of work indurated and shaped—in his imagination if not in fact—by long custom. Mr. Lloyd does not allow sufficient weight to the old apothegm as to unity giving strength. We cannot find that he advances any sound reason why there should not be a national organization, with the Michigan Association as one of its components, and why the latter, as well as other existing similar organizations, should not at the same time maintain their own individuality and continue their own special work, the same as the District Associations are doing in this country. If there is to be a National Association for America, there is something selfish in preferring isolation, and yet enjoying the fruits that are the common proceeds of the united endeavour of others.

In lieu of the national organization, Mr. Lloyd pleads for a development of the Michigan Association; and it seems to us that he is proposing a combination of objects that will not comfortably commingle. To fortify and invigorate a technical and scientific body composed of professional gas engineers and managers, there is no positive reason why there should not be a class in the membership directly representative of Boards of Gas Directors and Municipal Gas Committees, in order to cultivate their sympathy and their esteem for the work that is being carried on, and to supplement the wherewithal for broadening the sphere of usefulness in so far as the work properly appertains to such an organization. Mr. Lloyd, however, would go even further than this. He would, while admitting gas companies to

membership, permit the Association to depart from its especial work, and develop into something that appears much like a protectionist body for companies. There are socialistic threatenings against the companies; and sooner or later the State are likely to undertake some measure of regulation. These are not the affairs of a technical organization, but rather of a separate body specially created for the purpose. Mr. Lloyd would also have the Association adopt judicial functions, embracing personal questions, to constitute themselves the arbiters as to whether the methods of companies are based on strictly ethical principles, to act as a line of defence for members unjustly attacked from any source, to investigate charges of inefficient service by any company member, and to recommend corrective measures where needed. We can imagine that an Association arrogating to themselves such a range of power would not proceed far in its exercise without meeting with rebuff, and being told to mind their own business. The conjunction of such diverse objects does not, from our standpoint, commend itself. There is no identity between these and the original objects of the Association. What would happen, we fear, would be the sinking of work appropriate to such a body in favour of giving greater attention to personal and company interests. We do not say that the latter are not objects of excellence and moment, but we do assert that they should be the charge of a specially organized body. If the expansion of work that Mr. Lloyd delineates with such skill is split up into its appropriate and inappropriate elements, among the former we find nothing that a national organization and its depending sections could not undertake. His desire that the Michigan Association shall move forward into other work, is a laudable one; but in the consummation of the desire, heed must be taken that the new work—the too great aspiration and attempt—does not produce a wreck from which it would take time to reconstruct the useful organization as it at present exists. In this country, the incongruity of interest outside gas manufacture and distribution and commercial work, as between municipal and company administrators, would not allow them to coalesce in a single organization if its functions were extended beyond questions directly touching those of technical and commercial origin. Up to that point, they can work harmoniously; and we should indeed like to see Boards of Directors and Committees better supporting that work which has only one aim and end—the progress of the whole gas industry.

London County Council and Electricity Supply.

THE deficiency of business capacity of the London County Council has had for them dire exposure in the results of their management of the Thames steamboat and the South London tramway services. But it would be hard to beat what, if it were not for the seriousness of the matter, might be described as the grotesque example of business indigence presented in the passing (by a body of men appointed for administering vast powers) of a resolution to go to Parliament for authorization to carry out a scheme for electricity supply on a large scale, which scheme is yet without form, and upon which there is no knowledge as to capital cost or financial possibilities. The voting shows with distinct definiteness that the party of speculation is dominant in the Council; and this is a grave consideration for the future of London. Already in the Metropolis—multitudinous as we are, and thickly as we swarm—the *per capita* burden of debt exceeds that of any other urban community in the country, and certain districts of London are under the ignominy of being the heaviest rated in the land. This electricity scheme, if Parliament endorses it (but we have sufficient belief in Parliament to believe that it will not do anything of the kind), would involve an initial capital expenditure of anything between three and six millions sterling; and as the Finance Committee of the Council have already shown, in their preliminary report, there is to be no escape from an immense burden during the long unproductive period of construction and during the years of business incubation, to say nothing of the failure of the sanguine hypothesis as to the amount of business that is to be obtained to make the huge undertaking ultimately profit yielding, at the prices at which the produce of the generating plant must be sold to induce custom of any important and sufficient magnitude.

In the discussion last Tuesday on the recommendation of the Highways Committee that the Council should promote this Supply of Electricity Bill in opposition to the Administrative Company's scheme, one county councillor urged that "the supply of electricity in bulk to large consumers of undoubted solvency is eminently a business for a municipal authority." There is clearly the assumption here that the "consumers of undoubted solvency" are going to fall irresistibly into the arms of the County Council directly they are prepared to supply. The future is not, for the observant, so free from obscurity as to be able to look with such happy contentment upon this committal of the ratepayers to so enormous a financial adventure. What the Council are proposing to do, although this has not yet been put into concrete form, is to prepare for a definite quantity of business that is absolutely necessary to allow of the supply at a given price, and then trust to providential favour for the business to accumulate, to the visionary end that profit may ensue, and that the Council may thus find some grace in the sight of the ratepayers. This is not the scheme of astute commercialism and care, but the project of indifference, founded merely on unwarranted hope of gain and desire for supremacy. It is naked speculation, and speculation of the worst type, seeing that both capital and interest are to be secured at the expense of the ratepayers.

The people that, on the assumption of the County Council, are to be benefited by the scheme, are manufacturers and the Borough Councils. The latter are not at one in conceding anything further for the glorification of the County Council; moreover they have their own intercommunication scheme and some other plans in process of ripening. As to the manufacturers, they will look dubiously upon this concern of the County Council in their interests, for what good to the manufacturers of London has ever yet come from Spring Gardens? The Gas Companies have stern knowledge of the load of rates which they, among the manufacturers of London, have to bear; and that load of rates is exiling manufacturers of world fame from London, and more hospitable location is being sought by them elsewhere. Every manufacturing firm employing considerable labour—who with their employees are large consumers of local commodities, and payers of heavy rates—that is driven from London in this way makes it all the worse for those remaining, both in respect of rates and business. The manufacturers under present conditions will not regard benevolently this fresh proposal of the County Council, who have been the most active cause in the rearing of the present amazing municipal debt and rate, which are assisting to strangle them in their part in the strenuous life of the commercial world. What possible gain will it be to manufacturers if the Council do supply them with electricity in large volume at about 0·7d. per unit, and then, at that price on the business done, for them to have a certain period of increased taxation, and, so far as human perception can inform us, a perpetual addition? And as to the ordinary ratepayers, why should they be called upon to render any support to an undertaking from which others are to derive the benefit of cheapness? It may be suggested that there is as much assumption on our part as to failure, as there is on the part of the Council of success, to which we may reply that, on the showing of the Finance Committee of the Council (to whose report reference was made last week), the chances are overwhelmingly on our side.

The resolution to go to Parliament has been carried by the County Council; but appended to it is a provision that, before the introduction of the Bill into Parliament, opportunity shall be afforded for a full discussion of the whole subject by the Council, especially in respect of the financial consequences of the scheme. On the face of this, it looks as though the resolution has been passed merely with the view of suffering the initial parliamentary formalities to be proceeded with, so that, if eventually the Council should determine to proceed, they shall not be forestalled by the Administrative Company or lose a session. The proviso, in our opinion, is of no value whatever. There may be a discussion later on never so full. The voting last Tuesday, however, is without doubt conclusive of there being a majority of the Council who are determined next session to test their fortune in Parliament against all comers for the superior control of the future of electricity supply in London. It is not safe to prophesy; but there are things that are more unsafe in the saying than that the County Council will appear in Parliament next session (after their resolution of last Tuesday, it would be an outrage on the

dogma of municipal trading if they did not), and with an inglorious result. Last session, on the Administrative Company's Bill, the County Council contended that there was no public necessity for such a scheme, in view of the provision already made by the Borough Councils and Companies. The change within three or four months is a remarkable one; and it is plain there will have to be a great eating of words in the Committee rooms if the Bill gets so far. Besides which the Finance Committee in their report have given Parliament all that is required to accord but brief life to the Council's proposal, and to smartly return them to the business that more immediately concerns them. The procedure of the Council is all that the Administrative Company can desire to ensure the success of their scheme. If London is to have forced upon it a great electricity-in-bulk and power service, then we should infinitely prefer to see the gambling entered upon by a private company than by a municipal authority. But we are quite satisfied that the present undertakings are equal to the needs, and that London is not at present languishing for the want of electrical assistance either from the London County Council or from the gentlemen hailing from Tyneside.

Gas Companies (Removal of Sulphur Restrictions) Bill.

We have obtained from the Secretary of the Gas Companies' Protection Association (Mr. F. E. Cooper) a list of the Companies who have decided to join in the promotion of the above-named Bill. Including the three chief stations of the British Gaslight Company, sixteen undertakings are represented; and it will be remarked that they are all concerns of considerable importance. The promoting Companies (in alphabetical order) are: British Gaslight Company, Limited, in respect of their stations at Hull, Norwich, and Staffordshire Potteries, Cambridge University and Town Gaslight Company, Hampton Court Gas Company, Harrow and Stanmore Gas Company, Hastings and St. Leonards Gas Company, Ipswich Gas Company, Newcastle-upon-Tyne and Gateshead Gas Company, Reading Gas Company, Richmond Gas Company, Shrewsbury Gas Company, Tunbridge Wells Gas Company, Walker and Wallsend Union Gas Company, Wandsworth and Putney Gaslight and Coke Company, and Wolverhampton Gas Company. As we stated last week, the Directors of those Companies whose undertakings are under the sulphur clauses, but whose gas is not tested, are not in agreement as to the propriety or otherwise of joining in the promotion of the Bill. Some of the Companies consider it better to allow the matter to rest, rather than re-open the subject with the local authorities, while others—most people will consider more prudently—recognizing the fact that their gas might at any time be tested for sulphur impurities, deem it advisable to be parties to the promotion of the Bill, and thus endeavour to get rid of the sulphur restrictions for all time. There are other Companies who, it is believed, would have joined in the promotion if there had been more time. It may be that some of those who are left outside this promotion, from whatever cause, will have occasion to regret it; for we cannot help thinking that those who initiated this measure were keenly alive to the importance of an immediate following up of the recent Metropolitan successes.

The Gas Question in Paris.

On the re-assembling of the Paris Chamber of Deputies on the 31st ult., their attention was called to the fact that, in view of the termination of the concession of the Gas Company at the close of the year, some decision would have to be come to on the question of continuing the supply of gas after that period. They were reminded by M. Morlot, who had charge of a Bill to sanction the raising of the necessary funds (120,000,000 frs.) to enable the city to purchase its share of the Company's assets and carry on the service under direct municipal control, that a year ago they had voted in favour of the entire proposal, but that the Senate had rejected the portion authorizing direct management. The matter was sent back to the Chamber and considered by a Committee, who amended the Bill in such a way as would, it was hoped, overcome the objections of the Senate; and M. Morlot asked his colleagues to pass it as they had previously done. The subject was warmly debated at intervals until the 8th inst., when the then Minister of the Interior (M. Étienne) brought the discussion to a close by pointing out that the Senate had, by a small majority, rejected municipal control because they considered it to be a step towards Collectivism. But the examples of the principal European countries under monarchical government which had adopted public control furnished proofs to the contrary. Speaking on behalf of the Government, he called upon all those who had the interests of the city at heart to support M. Morlot, and agree to the Bill. After this appeal, the preamble was passed, and the consideration of the clauses was proceeded with. The only matter which caused much discussion was the legal position of the consumers in the event of any dispute arising between them and the body controlling the supply; and it was decided that all differences should come under the jurisdiction of the Civil Courts. During the sittings of the Chamber, there had been some rather stormy debates on other matters, which had led to a change in several offices, among others, that of the Minister of the Interior. M. Etienne's successor (M. Dubief) entered upon his duties towards the close of the discussion of the gas question on Monday last week; and one of his first official acts was to appeal to the Chamber to pass the Bill, in order that the Senate might have time to confirm their decision before the close of the year. This they did by a show of hands. The Chamber, with the support of the Government, have thus brought Paris one step nearer the municipalization of the gas supply. It now only remains to await the action of the Senate.

In the Grip of a Gas Commission.

In another part of the "JOURNAL" will be found an epitome of the Act passed last June for the constitution of a Commission to control the Gas and Electric Light Companies of New York. This piece of legislation was the outcome of an inquiry held early in the year under the presidency of Senator Stevens, in the course of which there were some curious revelations; but, so far as we were able to follow the evidence, the conduct of the Companies was not so bad as to call for the stringent measures which have been passed into law. In order that their extent may be appreciated, we have given some of them in full. These powers are to be exercised by a body of three Commissioners, who are to be appointed by the Governor of New York with the consent of the Senate. It is very properly specified that they are not to be connected with, or own stock or bonds in, any of the undertakings under their control; but it is not required that, as in the case of the London Gas Referees, one of them shall have had some practical experience of gas manufacture. Their powers, as will be seen, are much wider than those entrusted to the body which the South Metropolitan Gas Company sought last session to abolish, as they not only apply to the quality of the gas and the pressure at which it is to be supplied, but to the internal management of the concerns—such as the manner in which their accounts are kept; and the Companies are to report annually to the Commissioners on their financial position and on the condition of their works and plant. Should any of the Companies be desirous of transferring their works to another, they must first obtain the written consent of the Commission. No new Company subject to the supervision of the Commission will be allowed to issue stocks or bonds without their permission. Complaints in regard to the quality and price of gas are to be considered at a public hearing; and any decision come to is to remain in force for three years. It is fortunate that the parties adversely affected have the right to go to the Court of Appeal, who may modify or reverse the order of the Commission. But, in any case, expense will be incurred in conducting their defence. It will be seen from our epitome of the Act that the Gas and Electric Light Companies of New York have to reckon with a body armed with far-reaching powers. Each Commissioner will draw an annual salary of $8000; and they will have appropriated to them, as a body, a sum of $60,000 for the payment of salaries and disbursements. They are to meet at least once a month. Up to now they have been occupied mainly with considering certain proposed new issues of bonds; but it seems highly probable that they will soon have to turn their attention to the effect of the recent legislation on the gas supply of the city—the restriction of the pressure to 2½ inches maximum, to which reference was made in a recent issue, having given rise to much complaint among the general body of consumers.

Union Funds and Labour Representation.

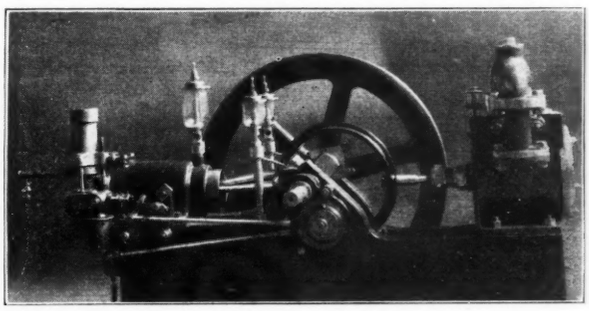
Some remarks were made in the "JOURNAL" a fortnight ago on the subject of a reference in the recently issued report of the Chief Registrar of Friendly Societies (Mr. J. D. Stuart Sim) to Trade Union support of Labour Representatives. This reference, which at the time attracted widespread attention, was to the effect that, as many Trade Unions were seeking to include in their objects such extraneous matters as the promotion of Labour Representation in Parliament and in other elected bodies, the Chief Registrar had found it necessary to point out that such matters were not within the definition of a Trade Union contained in section 16 of the Trade Union Act of 1876. The precise effect of this pronouncement is at present a little difficult to understand; for it is stated that, since the issue of the report in question, Mr. Sim has accepted the following provisions contained in a special rule submitted by the National Amalgamated Union of Labour: (1) The payment of a penny a member per quarter for Labour Representation purposes; and (2) payment out of the sum provided of a contribution to the National Representation Committee. Similar proposals have also been passed in the case of another Union; so that there appears to be a simple way out of the difficulty. The explanation given of this seeming inconsistency is, according to the "St. James's Gazette," that what the Chief Registrar objected to was the inclusion among the objects of a Union of provision for the payment of a contribution for parliamentary purposes, instead of making it the subject of a special rule. This being the case, there is no need to fear that ambitious endeavours to largely increase the number of Labour Members of Parliament will be frustrated by so annoying a little circumstance as the cutting off of supplies. The existing parliamentary representatives of the Trade Unions must also breathe more freely now that their funds, which looked at one time to be in serious jeopardy, are apparently safe again.

A Case in Court.

There is, however, another aspect of the matter, which was alluded to in the course of our remarks a couple of weeks ago—that is, the objection of some Unionists themselves to the allocation to the Labour Representation Committee of money taken from the general funds of their Union. It was stated that a case of this kind was about to be tried; and last week the action referred to was heard in the Manchester County Court. The defendants were the United Operative Plumbers' Association; and the question—raised by the Canning Town Branch—was whether they had power to make and enforce a levy on their members for the support of such an outside body as a Committee established for the purpose of electing Labour Members of Parliament. It was, however, unnecessary for the Judge to decide the point, as correspondence was produced in which the Association admitted that they had been guilty of illegal conduct. A vote was taken of the different lodges of the Association with regard to the desirability of becoming affiliated with the Labour Representation Committee, and though a majority were in favour of such a course, the Canning Town Lodge were unanimously against it. As a result of the vote, 1s. per member was deducted for the use of the Committee from the contributions of the members of this particular Lodge; and this they objected to, on the ground that the rules of the Association did not provide for contributions by the members to any parliamentary fund or labour organization whatever. At first the Association were inclined to maintain that the levy was covered by the provisions of the second rule—"to raise funds for the management and advancement of the interests of the trade, and the regulation thereof, and the support of trades councils, trades congregations, trades federations, and such-like institutions." But—presumably on legal advice—they subsequently abandoned this argument, though at the hearing the Judge seemed inclined to think that Members of Parliament might be considered as "such-like institutions." By the admission of the central body of the illegality of their action, the members of the Canning Town Branch had attained their object for the time being; but they felt so much reluctance to trust the future officials of the Association in the matter, that they successfully asked for the issue of an injunction, which the Association had previously expressed their willingness to submit to. Therefore, until the rules of the Society are altered, the members of the Canning Town Lodge, at all events, will not be compelled to contribute to the parliamentary campaign. This case does not, perhaps, throw any fresh light upon the general question of the utilization of Union funds for parliamentary purposes; but it is of some little interest as showing that even Trade Unionists themselves are not by any means unanimously in favour of the introduction of the political element into their organizations.

HIGH-PRESSURE GAS LIGHTING AT BUCKINGHAM PALACE.

GAS again scores; and this time regally, for gas under the high-pressure system of incandescent lighting has been adopted for illuminating the front of Buckingham Palace. Ordinary incandescent gas lighting was in possession before; but improvement was wanted, and high-pressure incandescent gas lighting was preferred. Last night the lamps, under the altered conditions, were alight for the first time; and it was a truly magnificent spectacle. A flood of light was diffused across the Palace courtyard and the outer pavements and roadways; and as the Palace was approached in the distance from the Mall, the brilliance at the end truly befitted the royal residence. The electric arc lamps drooping from their swan necks in the neighbourhood looked pitiful objects; and, in face of the great glitter, they seemed to concentrate their light more than usual. Ordinary incandescent gas-lamps in the proximity likewise did not look at their best in the face of the majestic radiance of the new lights. The change has been carried out by Messrs. William Sugg and Co., Limited, in conjunction with the Gaslight and Coke Company; and they are proud of the result. Altogether, at the entrances and along the railings, there are 28 lamps; and they are disposed in this way: On each pillar at the two Sovereigns' Gates, there are five lamps—being arranged four in a circle, and the central one raised above the others. The four lamps each contain one 500-candle power burner and the central one two burners each of 500-candle power. So that these two gates account for 20 lamps, and from each pair of pillars, or at each gate, there is a light of 6000 candles, or 12,000 candles at the two gates. Certainly a fitting light for the



THE GAS-ENGINE EMPLOYED FOR COMPRESSING THE GAS.

entrance of kings! At each of the two ordinary gates, there are two 1000-candle power lamps; so that here we have accounted for four more lamps and 4000-candle power. Along the railings, there are disposed the remaining four lamps, each containing two burners, and so each are yielding 1000-candle power. Therefore, we have along the front of the Palace, from these 28 lamps, a total illuminating power of 20,000 candles. The handsome lanterns are of hexagonal shape, but are not new; and the only alteration that has been made in them is the fitting of new reflectors for the purpose of getting a good diffusion. The burners are of Sugg's new pattern for high-pressure lighting; and the mantles are also those that they specially produce for this form of lighting. The gas-compressor and gas-engine are situated near by the guardroom, in a building about 8 feet square and 10 feet high. The engine itself is an exceedingly neat little machine, as will be remarked from the illustration. It is one that Messrs. Sugg and Co. have built specially for this kind of work; and it is only of 1½-horse power. The plant is direct driven. A duplicate plant has been put in, so as to be perfectly assured against accident. The gas is supplied to the burners at 16 inches pressure. One of the great features of the lighting is that it all lights up simultaneously, as soon as the engine is started. A separate pilot-light service is provided; this having been thought preferable to taking the gas for the pilot lights from the main service by the employment of valves. To have kept electricity from such a position, is certainly a huge success.

The funeral took place last Wednesday, in the presence of a large number of relatives and friends, of Mrs. Henry F. Willey, widow of Alderman Willey, an ex-Mayor and Sheriff of Exeter, and mother of the late Mr. Henry A. Willey. The bearers were employees of the firm of Willey and Co., all of whom acted in the same capacity for the late Alderman H. F. Willey, Mr. A. W. H. Willey, and Mr. H. A. Willey.

REMOVAL OF NAPHTHALENE FROM COAL GAS.

THE account of the investigation of the naphthalene problem in the United States by Messrs. White and Clary, published in the last two numbers of the "JOURNAL," will be heartily welcomed and closely studied in this country; and the gas industry generally is much indebted to the authors (as well as to the Michigan University and to the Michigan Gas Association) for the valuable work they are carrying out. The amount of time, care, and patience required to undertake such a series of tests as those already published will perhaps only be fully appreciated by those who have themselves attempted work of a similar nature; and all who have done so will join in congratulating the authors, and will await with interest the publication of further results by Mr. White and the present holder of the Michigan Gas Association Fellowship, Mr. J. M. Barnes.

Differences of opinion will, of course, occur with regard to the conclusions drawn by the authors from their experimental results; and as some of these conclusions do not seem to be justified by the results, and also to be contradicted by other known facts, it is proposed to consider here some of these matters, in the hope that such discussion may be of assistance in elucidating the truth. The most important conclusion arrived at by Messrs. White and Clary is one which they recognize as "rather revolutionary"—namely, that for the removal of naphthalene from coal gas it is better to wash with hot tar than with the same tar when cold. Evidence in favour of this view is derived (1) from direct experiments on the absorption of naphthalene by different samples of tar at varying temperatures; and (2) from results of tests made with regard to the relative amounts of naphthalene in the gas, and suspended tar at various points in the condensing system of different works.

The direct experiments (1) are fully described in Appendix III. of the paper. These consisted in sealing up portions of naphthalene and tar, separated from each other, in a small bottle containing air, and heating the bottle in an oven that was maintained at a constant temperature until no more naphthalene was absorbed by the tar. Experiments were made at the following temperatures: 25°, 35°, 45°, and 72° C.; and the results showed, according to the authors, "the unexpected fact that the power of tar to absorb naphthalene increases with the temperature." Contrary to this statement, however, it appears that this result is exactly what would be expected under the conditions of the experiment, where the tar and naphthalene are heated together in the presence of a limited quantity of air.

It is a general rule that when a volatile substance dissolves in a volatile solvent, the vapour pressure of each constituent of such solution at any temperature is less than that of the pure substance at the same temperature. Now in the above experiments, we have in the bottle, separated from each other by air, a sample of tar (containing some naphthalene) and a sample of pure naphthalene. The air around the naphthalene will become saturated with naphthalene vapour at the temperature of the bath, and this air will diffuse over to the tar. The vapour pressure of the naphthalene in the latter will be less than that of the pure naphthalene; so that the latter will absorb some of the naphthalene from the saturated gas. Simultaneously, the pure naphthalene will absorb some of the vapours given off by the tar; and this double transference will continue until equilibrium is established. It follows, therefore, that the higher the vapour pressure of the pure naphthalene, the greater will be the percentage of the latter absorbed by the tar when equilibrium is attained; and as the vapour pressure of naphthalene increases with a rising temperature, the amount of absorbed naphthalene in the tar will also increase with the temperature, which is exactly what is shown by Messrs. White and Clary's experiments.

Let us next consider what is the condition of the gas contained in the bottle when equilibrium at any temperature is established. As there is equilibrium, the vapour pressure of naphthalene in the gas, the tar, and the naphthalene, which has now absorbed some tar vapours, must all be equal; and this vapour pressure will be less than that of pure naphthalene at the same temperature. But the vapour pressure of naphthalene increases with the temperature; and it therefore follows that, when the gas is in equilibrium with hot tar, it must contain more naphthalene than when in equilibrium with the tar at a lower temperature. The contrary conclusion would only be possible if it could be shown that the vapour pressure of naphthalene when dissolved in tar—contrary to the behaviour of all other volatile substances dissolved in a volatile solvent—decreases with increase of temperature. This cannot be the case, inasmuch as, if it were so, it would be impossible to separate naphthalene from coal-tar by fractional distillation; for the latter would then distil over with the lowest boiling portions of the tar, and the proportional amount in the distillate would decrease as the boiling point of the tar rose towards the boiling point of naphthalene. The contention of Messrs. White and Clary, that "for purposes of naphthalene removal it is better to scrub the gas with hot tar," is therefore untenable; but on the contrary, when equilibrium is established between any sample of tar and the gas, the amount of naphthalene per unit volume left in the gas will decrease as the temperature falls.

A furthur argument against this supposition of Messrs. White and Clary is that, if this were correct, it must follow—as we are dealing here with an equilibrium between the gas and tar—that the amount of naphthalene given off by any sample of tar containing that hydrocarbon, to gas free from naphthalene bubbled through it, must decrease as the temperature of the tar increases; whereas, in fact, the quantity of naphthalene taken up by the gas under these circumstances rises rapidly with increase of temperature, as can readily be shown by direct experiment. On the other hand, we quite agree that equilibrium between the tar and gas is much more readily obtained with hot than with cold tar, inasmuch as the hot tar is much more mobile than the cold, so that the vapours absorbed on the surface are much more rapidly diffused throughout the whole mass of the tar. But such equilibrium, although more rapidly obtained, results in a much higher naphthalene content of the gas than when the temperature is lower; and if naphthalene is to be removed anything like completely in the condensing system, it must finally be brought in contact at a temperature approximating that of the atmosphere, with some portion or portions of the tar in which the vapour pressure of already dissolved naphthalene is low.

In a further article, it is proposed to consider the evidence derived from the series of naphthalene tests, given in the paper, which were made on the crude gas in the condensing system of the various works.

Mr. Colson's Selection of a Solvent.

It is not surprising that Messrs. White and Clary's pregnant paper should have aroused such widespread interest as it has done. Certain passages in it have some bearing upon the selection that Mr. Alfred Colson made of a solvent for dealing with naphthalene; and, in view of the controversy to which the application of that particular grade of solvent gave rise, it may be of interest to direct attention to the remarks in Messrs. White and Clary's paper, which have a somewhat striking connection. They are to be found on p. 467 of last week's issue, and are as follows:—

> It is possible that naphthalene may be contaminated by other hydrocarbons; and, as was pointed out last year, the deposit is sometimes slightly oily, and has a low melting-point. An attempt has been made to determine the nature of this oil; but its small amount makes it difficult. It has been shown that it is an unsaturated hydrocarbon; and it is very possible that it is the little-known indene (C_9H_8)—a transition product between benzol and naphthalene, *which has been isolated from the tar distillates in which naphthalene occurs to the greatest extent*. This oil has been found quite abundantly in our analyses of some tar distillates, as would be expected of indene. It is also present in some tars to a greater extent than others. *In any case, however, it seems justifiable to report it as naphthalene, because it will be found associated with it*, and will separate out with it on a large as well as a small scale. *It is possible that the presence of this oily liquid may aid in preventing solid deposits of naphthalene; and its occurrence is worthy of note.*

It will be remembered that the point which Mr. Colson made, when he applied the oil-washing system at Leicester, was that the solvent he was using was provided from tar distillates *where naphthalene most obtains*—indeed, it is taken from the very home of naphthalene. In his patent specification, it is stated that the solvent is got from "creosote surcharged with naphthalene and that the required oil (obtained by distilling) contains a little naphthalene." In a letter from him, too, that appeared in the "JOURNAL" for Oct. 18 last year, he stated that the solvent is "obtained and taken from those tar distillates where naphthalene is most abundant." In working the process at Leicester, Mr. Colson has confessed that he has been much surprised at its success, seeing how small a reduction in the quantity of naphthalene contained in the gas is brought about by the washing. Speaking generally, on the outlet of the oil-washers, the quantity of naphthalene contained in the gas is about a quarter to a third less than the quantity on the inlet; and frequently the reduction is even less than this. To all those who have visited the works to see the process in operation, Mr. Colson has stated his conviction that the success must be due to something beyond the actual reduction of naphthalene in the gas—probably to lubrication. Now (a most important point) as to the "little naphthalene" contained in the solvent. When Mr. Colson drafted his specification, he was under the impression that the deposit *was naphthalene;* but for a long time he has felt convinced that it is some other substance, but at the same time is unable to suggest what it is. His reasons for coming to this conclusion are that the substance is always over in the distilling well before the boiling-point of naphthalene is reached; that in appearance it is much more refined than naphthalene; and that, on working it between the fingers, it feels more like soft soap, as compared with the gritty sensation noticed if naphthalene is so treated. The American report seems now to carry conviction that the "little naphthalene" in the solvent is not naphthalene at all, but "indene," and that the Leicester success to a very considerable extent is, Mr. Colson thinks, due to its presence. In inspecting the solvent in operation at the Leicester works, it is remarked that there is a depth of froth—some 9 inches—consisting of minute globules, that is produced by the gas passing through it, and although Mr. Colson has worked with all tar distillates, he has never obtained to anything like the same extent the same result from any other description of solvent. Dr. Colman is strongly of opinion that the frothing referred to is a most important factor in the process, and in this Mr. Colson agrees. In his judgment, this is brought about almost entirely by the presence of "indene," and results in the gas being thoroughly

lubricated—thus "preventing solid deposits of naphthalene." It may be the synonymous phrases "tar distillates in which naphthalene occurs to the greatest extent" (American), and "tar distillates where naphthalene is most abundant" (Leicester) will prove of no little importance in this question of naphthalene. It is considered very fortunate at Leicester that "indene" occurs in the least valuable of tar distillates, and the one, too, that lowers the illuminating power and calorific value of the gas less than any other—that is, so far as the Leicester experience goes.

THE SUN GAS COMPANY, LIMITED.

A PROSPECTUS issued last week by the Sun Gas Company, Limited, invited subscriptions for the purpose of increasing the original share capital of the Company of £25,000 to £100,000. The new issue of 75,000 shares of £1 each was offered for subscription at par, to be fully paid up on allotment. The Company since its formation in April last has been engaged in exploiting a process for the generation of acetylene from calcium carbide and certain salts or other solids, without the direct intervention of free water. What success it has to the present time achieved in this direction does not appear from the prospectus just issued; and the new capital is stated to be required for purchasing a controlling interest in the Alby Carbide factory in Sweden, and is not apparently necessary for the immediate development of the acetylene business proper. Nevertheless, the Directors are sanguine that the latter business will extend very largely; and they seemingly fear that it may outstrip the growth of the carbide industry, for they state that, in view of certain developments, it "was imperative that the Company should be in a position to guarantee a large and regular supply of carbide—a result that was only practicable by securing a controlling interest in a carbide manufactory." Many business men will not acquiesce in the conclusion that there was no other practicable way of securing the desired result or position; and it is not easy to see why a contract for a term of years with one or other of the considerable carbide factories should not have sufficed to guarantee a large and regular supply of carbide. The Company's advisers, however, see otherwise; hence the decision to buy a controlling interest in an established Swedish carbide factory.

This factory has been inspected by Mr. H. B. Weeks, F.I.C., F.C.S., Chemist and Metallurgist, of Barrow-in-Furness, and a *résumé* by him of his report thereon was circulated with the prospectus. Now the calcium carbide produced at the Alby Carbide works has hitherto been largely imported into this country, and has a deservedly high reputation for uniformity and good quality. It is, therefore, only a question whether such superior carbide will command a sufficiently high price and wide sale to make its manufacture so profitable, on the scale contemplated, that fair dividends may be declared on the additional capital of £75,000 which is now being raised by the Sun Gas Company. Last year the Alby Carbide factory made a profit of £6671; and it is hoped by doubling the output, with concomitant reduction in the cost of production, to raise the profit in future years to about £19,000. If this hope is realized, even in only small measure, it is evident that a good return will be secured on the £75,000 invested. It must be remembered, however, that the price obtained for carbide must not fall greatly below the 1904 level, and that power must not become more expensive. On the latter point, the prospectus does not appear to give the very necessary information as to conditions under which it obtains its water power from another Company. Presumably the agreement is for a supply for a certain term, at the expiration of which a more onerous rental may be exacted from the carbide works. But there is no mention of the duration of the term, or alternatively that the supply is promised in perpetuity. Apart from this, however, there is little fault to be found with the investment of capital in the purchase of the Alby Carbide shares.

It is in the association of this purchase with the exploitation of a special process for the generation of acetylene that we foresee greater risk. The special process has certain advantages, and the Home Office have conceded the right to mix acetylene generated thereby with oil gas in any proportion not exceeding 50 per cent. of the mixture, which may then be compressed up to a pressure of 150 lbs. to the square inch (*i.e.*, about 10 atmospheres). Ordinarily, only 20 per cent. of acetylene is allowed in a mixture for compression to that degree. Thanks to this concession, the Company are hopeful of doing much business in connection with railway-carriage lighting. The incandescent mantle, however, has now demonstrated its practicability for use in railway carriages; and with its advent the need for a gas which gives a high illuminating duty in self-luminous flames is no longer apparent. It is unlikely that railway companies will decide to use the acetylene mixture, when by adopting an inverted or other incandescent burner they can obtain an almost equally high duty from cheaper gas. Acetylene generated by the dry process should, however, compete fairly successfully with dissolved acetylene for certain uses. Having in view the more general application of which the Company consider the process capable, some authoritative data should have been included in the prospectus as to the yield of acetylene obtained thereby from a given weight of carbide of standard quality. If the process is equal in this respect to a good wet system of generation, its obvious advantages should give it a wide field of application for many purposes. The Sun Gas Company will then have good prospects in regard to both acetylene generation and carbide manufacture.

A Correspondent writes: In the struggle for advantage, it is not counted as derogatory of human virtue to decry the goods and processes of competitors in the same field of commerce. This was seen in your "Electric Lighting Memoranda" last week, when the asseverations of electricians were quoted as to the non-penetrating ability in fogs of all types of electric lamps up to recent times. This is a fact that has been fairly employed by the gas industry for the last twenty years; and it is now actually being advanced by the makers of new forms of electric lamp as a long-accepted truth. A reminder of this is given by the prospectus issued last week by a new venture which has risen to life under the significant title of the "Sun" Gas Company, and which has no doubt given the public visions of perfect luminosity, warmth, and so forth. The document is one upon which the best art of the prospectus draughtsman has been expended in the consuming desire to get a considerable capital from the pockets of a confiding public. In the prospectus, it is said that, with acetylene gas generated by the action of water on carbide of calcium, there have been difficulties, dangers, and other drawbacks; and "it is therefore sufficient to state that, by dry generation, it is believed, all these objections have been avoided." It is not "sufficient" to say "it is believed;" and the interpolation of these three words it is hoped has had the effect of raising doubt, in the minds of investors on the look-out for safe places in which to profitably put their money. Something more about this "dry" process of acetylene generation can be learned by turning to a letter published last Thursday in the "Pall Mall Gazette." In this it is stated that, by the process, consumers will have to pay twice as much for the gas as they have hitherto had to pay.

The facts are as follows: Acetylene, as at present generally manufactured, requires (1) carbide of calcium; (2) a supply of water. The cost of carbide per ton is £15; and for £15 you get a certain amount of gas. The cost of acetylene by the dry process will be as follows: (1) One-third of carbide of calcium; (2) two-thirds of soda. Therefore, for a given quantity of gas, it requires one ton of carbide and two tons of soda. By the time the cost of the soda is added on to the cost of the carbide of calcium, the acetylene produced will, all other things being equal, cost the consumer twice as much as with any other process on the market. But all other things are not equal. The carbide itself, in order to mix with the soda, has to be crushed to gunpowder size; and in the crushing process, a considerable part of the gas is lost.

The prospectus goes on to make some fuss over an "Order in Council" relating to compressed acetylene in admixture with oil-gas, which allows the compression of acetylene in conjunction with the latter to the extent of 50 per cent.; but there is no indication that the Secretary of State has any intention of specially favouring the "Sun" Company. Anyone who cares to run to the expense of having duplicate plants for the production of oil gas and acetylene, would now, in all probability, get equal consideration with the "Sun" Company in this matter of compression. But the general public cannot be expected to be cognizant of these things; and for the Company promoter such ignorance is occasionally useful. Furthermore, the copies of the prospectus published in the newspapers—at all events so far as they have come under notice—do not give any information as to the costs of generating the acetylene and manufacturing the oil gas; and, from both the technical and commercial points of view, this is an unpardonable deficiency. The Company have purchased a carbide factory in Sweden, from which huge profits are also predicted. But there has been such an over-production of carbide of calcium, and such a comparatively small request for acetylene, that the price of carbide has fallen considerably, and works have had to be closed in consequence. Acetylene has not made great headway in this country, for, besides its own inherent defects, it has cheap, convenient, and long-established competitors against it; and assuming the Sun Gas Company have got the money required to start business, their prospects are not any brighter than the clouded experiences of those who trustingly put capital into acetylene in bygone years.

Monazite.

In the Colonial Office series of reports, the recently issued one on Southern Nigeria states that monazite is widely distributed, though usually in very small quantities, over practically the entire district of the Oban Hills excepting the part carrying cassiterite. The localities from which the best concentrates have been obtained are the neighbourhood of the Calabar River to the south of Ibum, where the track from Notim to Ibum crosses it, and to the north-west of Ibum, towards Awai Ikuri. The composition of these concentrates is being determined, and their commercial value ascertained, at the Imperial Institute. The associated rocks consist of both granite and gneiss of many varieties, the majority of which apparently contain monazite; and it is this distribution through a series rather than in one rock alone which has probably determined the wide distribution of the mineral, and which, at the same time, militates against the occurrence of a constantly rich deposit over a considerable area.

NATIONAL PHYSICAL DEGENERACY.

An influential Committee, of which Lord Rayleigh was Chairman, in 1898 presented to the Treasury a report embodying the results of its deliberation on the question of the desirability of establishing a National Physical Laboratory for the purpose of carrying out certain testing, standardizing, and research work. The Committee reported that a public institution should be founded for this purpose, and shortly afterwards effect was given to the recommendation by the establishment of the National Physical Laboratory at Bushey House, Teddington. A grant is made annually from the National Exchequer towards defraying the cost of its maintenance; donations from private individuals and firms have also assisted it greatly; and the Governing Body is authorized to charge fees for standardizing or verifying instruments, and for other similar purposes.

The Institution started work amid a chorus of general approval of its objects, and with every prospect of a successful and useful career. There is now, however, a feeling abroad in technical, industrial, and scientific circles of widespread distrust of its objects and a deep-seated scepticism of its worth. It therefore becomes pertinent to inquire if the ill-repute it has acquired is well founded; and, if so, by what process of degeneration its original lofty and useful aims have been lowered in the course of its existence. Let us inquire what it has done and is now doing, and see whether it has fulfilled and is fulfilling its *raison d'être*, and is thereby proving itself deserving of continued support from the State purse.

A few months ago, the first volume of a publication of "Collected Researches" carried out at the Laboratory was issued with a prefatory note by Lord Rayleigh, who is Chairman of the Executive Committee of the Institution. This note informs us that the volume embraces the results of the more important researches completed up to March last. The Director and his staff are, Lord Rayleigh thinks, to be congratulated on the interest and variety of the work done. Not, be it noted, on its utility or quantity; and a glance at the contents of the volume discloses the meagre output of but five papers, none of profound merit. The most lenient critic will admit that this is a feeble and utterly inadequate return for the large, if not lavish, expenditure of public and private funds which has taken place since 1898. Lord Rayleigh proceeds, as an unwilling spokesman it is quite plain, to offer some apology for the lack of result. He says: "A multitude of other problems of scientific and technical importance press for solution. Some of these are already in hand; but the rate at which progress can be made in them will depend, in great measure, upon the amount of support which may be forthcoming from those more immediately concerned in the development of industry. It is hoped that the publication of the present volume may serve as a stimulus, by showing the character of the work of which the Laboratory and the staff are capable." We suggest that, in pursuance of this idea, persons who may contemplate giving support either directly or indirectly to the Laboratory should look at the volume, which will, we think, act as a stimulus to the withholding of support until the Institution proves that it is more worthy of it. At present it stands condemned by its official publication.

The National Physical Laboratory has taken over the work of testing certain instruments which, prior to its establishment, was carried out at Kew Observatory. This work is mainly of a routine character, and appears to be done as well as formerly. But with certain extensions of its scope, manufacturers of instruments appear less well satisfied. Of the value of such verification and testing of instruments by a public laboratory, there is little question; and the National Physical Laboratory should consult the best interests of our great industries by devoting energy and application to this branch of its labours. The Kew certification of watches undoubtedly advanced watch-making; and therewith much else. The National Physical Laboratory can, and it will, similarly benefit other trades.

Have we referred to all that the Laboratory has done, or is now doing? No; for a glance at the official statement as to tests and measurements undertaken in the Physics Department reveals a far wider field of activity. We learn that it will undertake all such tests on machines, instruments, and materials as its equipment will permit. It will determine a melting-point for 7s. 6d., and analyze alloys on the scale of fees of a guinea for one and half-a-guinea apiece for further constituents. Not exorbitant fees, maybe; but then the Institution receives a State grant for its maintenance! In regard to matters of more particular interest to gas-works, it will make determinations of the flash-point of oils and calorimetric tests of fuel. It was, we must assume, difficult to get these things done satisfactorily prior to the opening of this State Laboratory; or perhaps oil and fuel experts, not having State funds and donations at their back, were in the habit of charging higher fees than the National Physical Laboratory can afford to accept. It will further "undertake photometric work of all kinds;" and doubtless it is hoped that its assistants will supersede the gas examiners now employed by those local authorities who continue to have the illuminating power of the gas supplied in their districts tested. It makes a speciality of gas analyses, in virtue of its equipment with a M'Leod gas analysis apparatus. In November, 1903, some uncertainty seemed to prevail in the minds of the staff as to whether it could execute gas analyses with this apparatus; but it was hopeful of being able to do so shortly. Perhaps a few efforts with samples of the illuminating gas supplied in many parts of the country—for instance, by the Brentford Gas Company, whose district comes near Bushey House—would leave the staff less sanguine as to the utility of their cherished apparatus for technical gas analyses.

We have said enough to reveal the ambition of the Executive and Staff that the Laboratory should become a gigantic Institution for the carrying out of routine testing work—mechanical, chemical, optical, electrical, or what not. Perhaps such an Institution may be desired by a few, who will be satisfied with the results of technical tests made by a purely academic staff at remunerative fees. But there is another side of the question. Has Parliament made its grants, and have donations been given, to the Laboratory with the object of providing means for the gratification of the unbridled ambitions of the present Executive and Staff? Let us quote the terms of reference to the Committee who reported in favour of the establishment of a National Physical Laboratory: "To consider and report upon the desirability of establishing a National Physical Laboratory for the testing and verification of instruments for physical investigation; for the construction and preservation of standards of measurement; and for the systematic determination of physical constants and numerical data useful for scientific and industrial purposes—and to report whether the work of such an Institution, if established, could be associated with any testing or standardizing work already performed wholly or partly at the public cost." This sufficiently indicates the ample yet limited scope of the Institution which the Committee were in favour of establishing. Their report is clear as to the limitations which should be imposed upon it. It says: "It would neither be necessary nor desirable to compete with, or interfere with, the testing of materials of various kinds as now carried out in private or other laboratories." It then gives instances of proper matters for investigation, and says in regard thereto: "We could give other instances of the same nature, and have merely referred to the above subjects as examples of such matters as would, in our opinion, be proper for investigation at a Public Institution, as distinguished from the ordinary testing of materials used in commerce or in construction and machinery, which can be, and is now efficiently, conducted at private establishments." Yet, in the face of these explicit statements of its rôle, the National Physical Laboratory is offering to do routine commercial testing such as we have already referred to, and is largely committed to the simple testing of cements, steels, and other materials used in commerce or in construction. The gravamen of the charge brought against the Laboratory is, however, less that it is interfering and competing with private laboratories, than that it is carrying out its true duties perfunctorily, and is neglecting or limiting them in many directions, in order to misapply its funds to ends for which they were not contributed. Let the Executive Committee and, failing that, the General Board of the Laboratory, see to it that the Institution shall henceforth confine its efforts to its legitimate spheres of activity, and shall display more energy and application than hitherto in these spheres. Otherwise the National Physical Laboratory will be left stranded by the public—without State or other funds wherewith to fulfil its proper and useful functions.

The London and Southern District Junior Gas Association will hold a meeting next Friday, when Mr. W. H. Vanner, of the Walton-on-Thames and Weybridge Gas Company, will read a paper entitled "Naphthalene Complaints."

Moving Gasholder Tanks Bodily.—Owing to the need of oil storage at their Potrero station, the San Francisco Gas Company recently decided to remove from their Equitable works the tanks of two holders no longer in use. They were 72 ft. 6 in. diameter and 25 feet high; and the plates were thick enough to allow of the sides being raised 12 feet more, giving each tank a capacity of 25,000 barrels. Some difficulty having being experienced in connection with the operation, the Contractors (Messrs. Blume and Cramm) undertook to move the tanks bodily on barges across the bay. After taking out the two lifts and the top, and removing the frame, poles were erected on the inside over the points where the stringers which were to be used in lifting the tank were to be placed. From these poles wires were run to the outside edge of the tank, and the tank trussed, as it were, so that there would be no bending of the bottom, and so that the side would not get out of place. The tanks were then wedged up as high as convenient, and jacked to about 5 feet above ground. Under them were placed the ordinary timbers used by house movers and also rollers. The tanks were then skidded out to the edge of the wharf, which had been braced to carry them, and a barge drawn alongside at high tide, and one tank moved out to it. Meanwhile the tide went down, and left a corner of the barge supporting the outer corner of the tank—the other side of the tank remaining on the wharf; the tank, however, being shifted far enough ahead to be in a permanent position on the barge. When the tide came up, the barge lifted the tank clear of the wharf and was towed into the stream. The method of taking the tank off at the Potrero wharf was similar to that of loading; the barge being hauled at high tide to a concrete and stone bulkhead, and the tank lifted on the second tide after it had arrived there. Moving the tanks to the foundation was a simple operation.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 563.)

THE general features of the past week on the Stock Exchange differed but little from those of its predecessor. After a dullish opening, things began to improve; but they oscillated irregularly from dull to cheerful at short notice. It was settlement week, and there was a rather heavy account to adjust; and, as usual, there was less fresh business in hand. The tone at the close was fairly promising; high-class investment stocks being in some request. In the Money Market, there was a good demand for the purposes of the Stock Exchange and other requirements, which had a stiffening effect; but the close of the week brought relaxation with it. Discount rates were very firm throughout. Business in the Gas Market was buoyant and active; and transactions were far from being confined to the big issues, but were well distributed through the list. The tendency was very favourable; the rising tide of the previous week continuing in full swell. Several quotations advanced, and some of them made large strides. The public favour with which gas is regarded as investment, as we have recently had occasion to note, is declaring itself more and more. In Gaslight and Coke issues, the ordinary continued in excellent demand; and from the opening bargain at par (which was never repeated), it steadily hardened in price, until 101¾ was marked on Saturday. Of the secured issues, the maximum was quiet at 90 and 90¾; the preference quiet also at 111½; and the debenture more than usually active at prices ranging from 86¾ to 88. South Metropolitan continued as animated as it was during the week before, and advanced a point. Except a small amount done free at 130⅛, transactions were all between 130½ and 132. The debenture stock changed hands once at 87½. Commercials showed a little more animation than of late; and both capital stocks had a fractional advance. The 4 per cent. was marked at figures ranging from 115½ to 117; and the debenture was done once at 86. Dealings in the Suburban and Provincial group were fairly numerous, considering their usual average, and showed a good firm tendency on the whole. Alliance 7 per cent. was done specially at 14⅝, Brentford new at 198 and 200, Brighton original at from 223 to 225, and ditto ordinary at 164 and 165. North Middlesex marked 19, South Suburban 124½, West Ham preference advanced a point, and a small amount was done free at 123½, and ditto debenture marked 104½. Among Continental Companies, Imperial kept quiet until the dividend was paid, and then burst into activity. The price quickly ran up from 214½ to 222, which is 2½ higher than the stock was done at the previous week *cum. div.* Union also was in very good form, and realized 126 and 127; the quotation showing a rise of four points. European was lower, and marked 22 and 22⅛, while the part-paid shares changed hands at 15½. Among undertakings of the more remote world, Bombay realized 6⅝ and 7, and ditto part-paid 5; Cape Town 17¼, and ditto debentures 52½. Buenos Ayres was done at 12½ and 12 11/16, River Plate at from 12⅞ to 13⅛, ditto debenture at 96, Monte Video at 12 7/16, and San Paulo at 13¼. Primitiva ordinary marked several bargains at from 6⅞ to 7⅛; and ditto debenture was done at 98¾ and 99.

The closing prices are shown in our Stock and Share List on page 563.

ELECTRIC LIGHTING MEMORANDA.

Standardizing Electricity Supply, Lamps, and Methods of Testing—Manufacturers' Views—Standardization Considered Useful, but Pernicious—Board of Trade and Provisional Order Transfers.

UNANIMOUS acceptance of Mr. Leon Gaster's proposals as to the "Standardization of the Electric Light," which appeared in "The Times" a few weeks since, and were referred to in the "Memoranda" for the 31st ult., is not coming from the ranks of electric lamp manufacturers. Complying with an invitation to contribute their views on the suggestions in the article, several manufacturers have responded, and their replies have been published in the "Engineering Supplement" of our morning contemporary. But we have not yet seen a single communication from the electrical engineering profession to inform us as to whether or not there is any sympathy in that quarter with Mr. Gaster's judgment of the necessity for standardization and the subsidizing of the National Physical Laboratory in order that proper equipment for the work may be established. On the general question, we are not altogether in sympathy with rigid standardization in such a direction. The gas industry has had its load to bear in this respect. There has been the standardization of the methods of testing for illuminating power, purity, pressure, and so forth; and all the apparatus used in these respects for penalty testings has been specified and insisted upon to a very precise degree. This is all very well for academic purposes; and it is all useful enough for research work, and for obtaining a relative exactitude, when there is adherence to the defined methods. To hurl doubts, as is so commonly done, at the results of gas testings in view of this does not come with good grace from electricians, seeing that their own commodity is not subject to any of this rigidity, and they cannot even boast of having any one photometric system generally accepted and applied for ascertaining the values of their lamps. And, as a matter of fact, it is admitted that electricity supply, from root to use, does not yet—after these many years—comply with conditions that will allow of the bringing about of standardization. In the case of gas, we know precisely, through testings by statutory defined rule, the quality of the gas supplied. To have this fundamental knowledge, and to have what must be an approximate uniformity in supply, is of the first importance in realizing a fairly steady result from any given appliances for using the gas. In the case of electricity, so much cannot be said. There is no more reliability in respect of the constancy of the current than there is in respect of the lamps which come to us under specific denominations. This is a disadvantage and is unsatisfactory to gas supply as a commercial rival to electricity; and it should be remembered before electricians scoff at the photometric values of incandescent gas lighting, and expose (as they have done in more ways than one) their ignorance of the science of photometry. Electrical engineers have not, through their exemption from the rigour that has been placed upon gas supply, had occasion to give such close attention to the subject; and the electrical manufacturers appear to have adopted somewhat haphazard methods of rating their lamps. No one knows, excepting themselves, the methods by which the valuations are arrived at; and this is where some standard system of making their tests for valuation purposes would be to general advantage. The manufacturers have no doubt more experience in this matter than electricity station engineers; and in the correspondence before us, it is Messrs. Crompton and Co. who state that "photometric measurements can only be made by skilled observers." Perhaps we have here an explanation of the foolish comparisons that have lately emanated from the City and elsewhere—for ridiculous they are shown to be by the comparative photometric values given to low-pressure and high-pressure incandescent gas lighting. To the requirement as to skilled observers, there is another necessary condition, and that is that for official testings there should be standard apparatus and uniform environment.

But to the correspondence. To a communication by Mr. Wolf Defries, the honour of first place is given among the letters on Mr. Gaster's article in "The Times;" and it is to his views, as they are representative of others, that these notes will be principally addressed. In Mr. Gaster's suggestions, it is conceded by Mr. Defries and others, there is much that is essentially desirable, and much that would be inevitably mischievous. What we have been saying in the previous paragraph is largely in accord with Mr. Defries' opinion that there would be advantage in having new determinations of fundamental units and the methods of using and measuring them. There ought not to be in these days any great difficulty in arriving at acceptable determinations and test methods, without having to make excessively costly and elaborate preparation for the purpose. It is true that electric lighting is expanding in its varieties of colour, with the advent of almost every new lamp. But with the use of the "Flicker" photometer or other devices, variation of colour forms no barrier to the attainment of fairly consonant results as between the illuminating power of one light and another—kindred or otherwise. But, on the whole, it is clear that the idea of standardization rather affrights electricians; for they are not oblivious to the fact that there are many directions in electricity supply and the means of use in which divergencies in result may arise in any application of fixed tests. For which reason, it is held that a standard increase of efficiency in one respect may, for anything that is known to the contrary, involve a standard decrease of efficiency in another respect; and apparatus possessing essential advantages may be excluded by standards which do not secure them. Another argument against standardization is that at no time in electric lighting history more than the present, have fresh substances and fresh methods of construction been more actively sought, or more persistently examined; and no one can say what the next step will be. It is easy to agree that "the search after that step has necessarily been long;" and that "the experience of the last 25 years has shown it to be hard." Therefore it is thought, by some if not all, that standardization would inevitably lead to difficulties and discouragement, and would cripple invention and stereotype results. There is every appearance here of the worst being made of the case to avoid restriction. The electricians cannot be blamed; but we do wish their freedom was used a little more honestly in dealing with competitors. We have no fear that standardization would have all the terrible issues that have been conjured up, or that it would militate more than the present condition of affairs against the progress of the electrical industry.

There is also disagreement as to the National Physical Laboratory being the most suitable institution for the purposes that Mr. Gaster has advanced. By some it is thought that it would be; while others condescend the opinion that its usefulness might extend to preliminary experiment and as a Court of Appeal. But reading between the lines, it would seem that the manufacturers feel that, for real usefulness, the science of the laboratory requires leavening with more commercial and industrial knowledge. The laboratory is called "an instrument of precision;" and the "worst use that can be made of an instrument of precision is to strain or discredit it by work for which it is not suited." This does not refer to the initial work of standardization, but more to the photometrical measurement of lamps on the commercial scale.

One evil is cornered in this correspondence, that has not been unheard-of in connection with gas-burners—that is the abuse that is made by unscrupulous makers of certification by recognized authorities of sample fittings as a cover under which to palm off inferior goods on the public, as answering the description of the samples from which the certified results were obtained. There is a touch of humour in this consideration of the question of standardization, about the complaint of one firm that gas people give illuminating power results under laboratory conditions. It would be interesting to know under what conditions the illuminating power ratings of electric lamps are found and given, and especially of the conditions under which some recently-published illuminating powers have been obtained. The people who so complain supply the best argument of all for the standardization of electricity supply conditions, and methods and circumstances under which tests should be made, to replace the arbitrary methods and conditions under which they now affect to ascertain the valuation of their lights. From all of which, the conclusion may be drawn that there is a great deal of pretence about the illuminating values of electric lamps. Bearing upon the question of standardization, it will be remembered that complaint was made at the last meeting of the Municipal Electrical Association regarding the variable duty of glow lamps. The matter is under the consideration of the Sub-Committee on Physical Standards, presided over by Dr. Glazebrook, the Director of the National Physical Laboratory; and there is to be a conference this week of lamp-makers with the Sub-Committee in order to discuss the difficulties of standardization so far as carbon filament glow lamps are concerned.

Rather late in the day, but better late than never, the Board of Trade have decided to check the traffic by local authorities in Electric Lighting Provisional Orders. There have been in recent years a large number of instances in which the Board have found it necessary to revoke Provisional Orders through their remaining unexercised, and in which the local authorities having obtained Orders have entered into agreements with companies for carrying the Orders into effect. These agreements in many cases have been *ultra vires*, or at least of doubtful validity. The Board have, in consequence, issued a notice to the effect that in future they will not be prepared to grant an Order to a Local Authority, unless they are satisfied that the powers will be exercised either by the authority themselves or, in exceptional cases, by a company—*to be named in the Order—where special power is taken to transfer to the Company within a limited period.* While calling attention to this matter, the Board also announce a little more stringency in regard to the granting of Orders to individuals and unregistered companies. It is undesirable that statutory powers, involving the breaking up of the streets, should be exercised either by individuals or unregistered bodies ; and the provision that the Board have been inserting in Orders, that the powers shall not be exercised unless within a fixed period they are transferred to a duly registered company approved by the Board, has proved most unsatisfactory and inconvenient. In some cases, the Orders have lapsed by reason of the grantees being quite unable to form a company with capital sufficient for the purposes of the undertaking; and, in others, the submission to the Board of the proposal to transfer has been postponed to so late a date as to leave insufficient time for the due consideration of the matter. The Board have therefore now decided to require that the proposal to transfer—in the case of Orders granted to individuals and unregistered companies—shall be submitted to the Board not less than three months before the expiration of the period fixed by the Order for the completion of the transfer. This revision of the rules governing the granting of Electric Lighting Orders should prevent the perpetuation of the troubles to which past laxity has given rise, and which finally brought the validity of a transaction on the part of the Sudbury Corporation under judicial notice and dismissal as being *ultra vires*.

Under the head of Monazite, in the "JOURNAL" last month (p. 228), we published the gist of a statement that had appeared in the "Brazilian Review." The full reference is as follows: "During his trip to Sapucaia last week, Dr. Nilo Peçanha visited a plant recently erected for the centralization of monaziferous gravel found in quantity along the banks of the river Parahyba at a place called Lage, one league from Sapucaia. The installation consists of a machine, which separates from the gravel the finer particles of sand in which all the monazite is contained. This material is passed over eight Wilfley tables to separate the lighter associated minerals, as quartz, &c., and then through seven magnetic separators of Humboldt pattern to separate the iron minerals, ilmenite and menaccanite. The owner of the plant, Mr. Chaulos Rau, estimates that he can produce from a raw material containing but 2 per cent. of monazite, a finished product at the rate of 50 tons per month, which he values at 700 frs. per ton. If these figures are correct, it is probable that other installations will be erected for the treatment of the monaziferous sands, which appear to be widely distributed in river placer deposits; and thus the monopolists of the 'marinhas' (foreshores) may lose their control of the market. The greater part of the monazite produced in North Carolina is obtained by treatment of river ground carrying small quantities of monazite, so there seems no reason why similar methods should not be remunerative here also."

HEAVY TRADE VEHICLES AT THE OLYMPIA MOTOR EXHIBITION.

THE gas engineer who visits the Fourth International Motor Exhibition, which was opened at Olympia last Friday, and closes on the 25th inst., expecting to find a good collection of heavy motor vehicles that might be suitable for his gas-works' requirements will, we think, be disappointed. Especially will this be the case if he had his attention directed to preliminary paragraphs stating that twice the amount of space is devoted to the commercial vehicle section this time than ever before. There are only the names of 35 exhibitors given under the heading of "Heavy Vehicles;" and not all of these are arranged together, as would seem the natural thing to do, for some of them are placed in the main hall among the pleasure and touring cars. Besides this (as under the circumstances of the moment is but to be expected), the bulk of these commercial cars is made up of motor omnibuses, mixed up with a fair number of marine motors.

Further than this, it may be assumed that the gas engineer, on business more than on pleasure bent, would mark out for particular examination those heavy lorries that are driven by steam and fired with coal or coke. Of such, to the best of our personal observation, in the whole exhibition there are only five examples in the special trade section, and two others placed incongruously in the great hall. No doubt the explanation of this is partly to be found in the far greater attention that has, the last few years, been given to the petrol-driven lorry, with its advantages of speed, convenience, and compactness. The coming of the motor 'bus must also have caused a great spurt to be given to the manufacture and adoption of the petrol trade car, as distinguished from the heavier, slower, and bulkier steam-waggon. Thus it is not perhaps altogether surprising to find that at the two stands of Messrs. John I. Thornycroft and Co., Limited, there is no exhibit given of their well-known steam lorry; but they show, besides other cars, a 3-ton petrol trade vehicle, with platform body, which runs at a speed of 10 miles an hour. The famous Argyll Motors, Limited, are also devoting a portion of their works to the production of heavy trade vans of from 10 to 30 horse power, carrying 1, 2, or 3 tons, and varying in price from about £400 to £800. There are, of course, many other firms who are now giving particular attention to commercial requirements in this respect; but as for gas-works' purposes the coke-fed steam-waggon is undoubtedly the one most likely to be of interest and of service to the gas engineer, we will just mention the few examples to be seen at the Olympia Show.

At Stand No. 161, the Thames Engineering Works, of Greenwich, show a 4-ton steam lorry with open platform, such as is used for carrying coke in sacks. The boiler is of the locomotive type, for which great facilities for cleaning-out are claimed. The two coke bunkers, one on each side, hold altogether 5 cwt. of coke; and it is calculated that, with average running, 1 cwt. suffices for from 8 to 12 miles. The driving is effected by gearing, which runs in oil and is dust-proof, besides being easily examinable. The water-tank has a capacity of 110 gallons, which will last for a run of 25 miles; and for feeding the boiler there is an independent pump as well as an injector. A water-lifter is also provided for renewing the supply. Another point that may be noticed is that the exhaust from the engine is fitted with a small separator, the steam from which is carried through a superheater in the smoke-box, thereby considerably lessening the steam and smoke given off in travelling. It may also be noted that the boiler can easily be altered to use oil, should that be found desirable.

Messrs. Jesse Ellis and Co., Limited, of Maidstone, occupy the adjoining stand (No. 162) with a 5-ton steam tipping-waggon, the body of which can be tipped either by hand or by steam. Here also the locomotive type of boiler is adopted; while other features are the use of patent steel roller bearings, and an arrangement by means of which the thrust of the driving gear on starting is reduced. Another steam motor lorry, made by the "Hay" Motor Company, Limited, of Preston, is to be seen at Stand No. 163. It conforms to the requirements of the Local Government Board, and is to carry 6 tons; its tare being under 5 tons. Its main dimensions are as follows: Length, 23 ft. 6 in. over all; platform, 17 ft. 6 in. by 7 ft. 6 in., or 132 square feet; wheel base, 11 ft. 6 in. by 6 ft. 3 in.; driving wheels, 3 ft. 6 in. by 11 in.; steering wheels, 3 ft. by 6 in.; water-tank capacity, 200 gallons; fuel bunker capacity, sufficient for 40 to 50 miles; single-cylinder engine double acting, 10 inches in diameter and 12-inch stroke; speed, 80 strokes per minute at 5 miles per hour; price, £425. Messrs. Fodens, Limited, of Sandbach, show, at Stand No. 172, a 5-ton waggon fitted with their horizontal multitubular boiler. It is driven by a compound engine with double crank, and is priced at £550. A traction engine type of motor is exhibited by Messrs. Wallis and Stevens, Limited, of Basingstoke, having two speeds, differential gearing, and winding drum, together with a "Wallis" trailer provided with screw friction brake and draw bar.

The foregoing are the only five steam waggons in the "Heavy Vehicle" portion of the show; and it only remains now to notice the two isolated instances in the main hall. These are two special waggons for 5-ton to 8-ton loads, made by Messrs. T. Coulthard and Co., Limited, at Preston, and examples at Stand No. 96 of the Straker Steam Vehicle Company's motors. These are made with

either vertical or horizontal locomotive boilers, so that partisans of either the one form or the other can be accommodated.

We have thus briefly mentioned the very scanty display of steam motor-waggons for industrial purposes that is to be seen at the Olympia exhibition. But it must, of course, be understood that our remarks are applicable solely from the point of view of the gas engineer in search of something suitable for his own particular carrying trade. As we have already said, we think a better classification of the different sections might have been effected so as to facilitate examination and comparison. But as a general motor car show, it is decidedly impressive, and a wonderful exposition of what British manufacturers can do within a very short space of time. Only ten years ago there was no such industry. Now it is computed that last year 50 British firms manufactured about 7600 cars, which, at an estimated price of £400 each, means the enormous yearly output of over £3,000,000 in value. If this has been the result of only ten years, what may be expected in fifty or a hundred?

INCANDESCENT GAS LIGHTING AND ITS VARIOUS APPLICATIONS.

When passing in review the progress of the gas industry during the last fifteen years, no one can fail to be struck with the remarkable development which has taken place in the use of incandescent gas, for both private and public lighting. At the commencement of the period named, the value of the noteworthy discovery by Dr. Auer von Welsbach was beginning to be appreciated, especially on the Continent, owing, it may well be supposed, to the favourable opinion expressed upon it by the Jury of the Paris Exhibition in 1889, who awarded him a silver medal. Some of our readers may remember that the new burner was to be seen in the Gas Pavilion in the grounds of the Exhibition; and even in its condition at that time it drew from the Jury the remark that it was calculated "to render real service to the gas industry." If any evidence were needed of the justness of this appreciation, it could now easily be furnished by every important city in the world. In England, with true British conservatism, we were slow to adopt incandescent gas lighting; with the result that while in Vienna it was to be seen in nearly every café, in London it could only be found in the tea-rooms of a well-known Bread Company or in the establishments of a few enterprising licensed victuallers. In other words, while abroad the Welsbach mantle was to be frequently met with, here it had to be sought. What a change has been brought about! In London, the incandescent mantle has gradually ousted the flat-flame burner both in the home and in the street; Paris—the nursery of electric lighting—has in use close upon 52,000 incandescent burners in the public lamps, compared with about 1700 six years ago; Berlin has adopted them so generally that a recent search for the old flat-flames only led to their discovery on the gas-works; while the streets of Brussels are ablaze with incandescent gaslight after nightfall. But it is not in the domain of public and private lighting only that Dr. Welsbach's invention has verified the prediction of the Paris Jury. It has been found to be capable of rendering "real service to the gas industry" in several other directions; and these have been indicated in a work by M. Paul Lévy, which, as briefly mentioned last week, has lately been published in Paris,* and for which the author was awarded a silver medal at the recent Liége Exhibition. So far as we are aware, it is the most comprehensive treatise on the subject which has yet appeared; and it will therefore, we think, be of interest to our readers to give an epitome of its contents.

In his professional capacity, M. Lévy has had special opportunities for studying the progress of incandescent gas lighting during the past ten years; and in reviewing this period he has divided his subject into two parts. In the first, he deals generally with this system of illumination; in the second, he shows how it has been applied to the lighting of towns, railways, and coasts. Before taking up the main question, he gives a sketch of public lighting before the Nineteenth Century, and for this he acknowledges his indebtedness to the interesting work of M. Maréchal on "Lighting in Paris," which was noticed in the "Journal" a few years ago. He then describes the burners that were gradually introduced down to 1878, when the advent of the Jablochkoff electric light brought forth the high-power burners which were largely employed prior to the introduction of the Welsbach gas system. All these, however, were based on the generally-accepted theory of the incandescence of the carbon particles in the gas-flame. Of course, the principle of incandescence was known, as M. Lévy points out, long before Dr. Auer von Welsbach's discovery; but it was he who, as the outcome of several years of research, solved the problem of its practical application for lighting. Gas men were at first alarmed at the low consumption of gas with the new burner; but they soon recognized the great value of the weapon Dr. Welsbach had placed in their hands for fighting competition. These introductory remarks are followed by a detailed description of the burner and its mantle; and then comes a *résumé* of the various theories advanced on the subject of incandescence.

Having introduced the new system of lighting, M. Lévy proceeds to trace the various steps by which it has been improved. Taking burners first, he reviews the work of M. Auguste Lévy, one of the Engineers of the Paris Gas Company, M. Denayrouze, M. Saint-Paul, and M. Bandsept, and describes the burners produced by the three last-named Engineers, as well as the Kern, the "Boule," the "Millennium," the Scott-Snell, the Lucas, the Welsbach (high and low pressure), and the Selas burners. The author closes his descriptions of these appliances with a few remarks on inverted burners—taking for examples the "Farcas" and the "Liais." He next passes on to deal with the improvements which have been made in mantles, with the object of imparting to the light emitted rather more yellow rays than the original mantles furnished; and in this connection he notices specially the Plaissetty mantle. After offering a few observations on the general advantages of incandescent burners, M. Lévy closes the first part of his book with a table of the comparative values of different photometric units.

We now reach the second division of the author's subject—the various applications of incandescent gas lighting. First to be dealt with is public lighting; and he shows what immense strides the new system has taken in the past ten years. Having demonstrated its superiority over the flat-flame burner for private lighting, it proved that it was capable of effecting considerable improvement in the illumination of streets and roads. Paris—the City of Light—was among the first to recognize this capability; and as far back as 1893, the officials of the city had the subject under consideration. The ultimate result is to be seen in the streets to-day. In dealing with this subject, M. Lévy takes up successively, and at some length, the regulation of pressure; the utilization of the greatest possible quantity of the light emitted; the protection of the burner against wind, rain, and shocks; the chimney to be employed; and the various methods of lighting (including those worked from a distance). He closes his remarks on these matters with a few observations on altering ordinary lanterns to the incandescent system, and on maintenance. In the succeeding pages, he gives a sketch of the progress of public lighting by the incandescent gas system in France and other countries. It is a most interesting survey; the figures presented being a revelation. In France, the example was set in Paris; and as the result of the splendid show made by the Gas Company at the Exhibition in 1900, about 30,000 new burners were put in during the two next years. By the end of 1903, the flat-flame burners had disappeared, and the city was lighted entirely (so far as gas was concerned) by incandescent burners. The lead of the city was quickly followed by the suburbs and the provincial towns. In Germany, the new light made more rapid progress than it did in France. England did not do much till about 1902; but then she went forward rapidly. Belgium, Switzerland, and other countries joined in the movement. M. Lévy next sets forth the conditions to be studied in order to obtain good public lighting by the incandescent gas system. He gives a comparison of the net cost (exclusive of maintenance) for one carcel-hour of the several systems usually employed, and shows that while the flat-flame gas-burner costs 1·9 c., the ordinary Welsbach burner costs 0·24 c., the Bandsept 18 c., and the various intensified burners 0·15 c. Where acetylene is the illuminating medium, the figures are 1·82 c. for an open-flame and 0·78 c. for a mantle burner; while for electricity the incandescent lamp costs 1·40 c., and the ordinary 8-ampere arc lamp 0·35 c. This chapter closes with a few remarks on public lighting accessories.

We now come to the portion of the book dealing with what may be called outside applications of incandescent lighting, the first of which to be noticed is its use on railways. The author begins by taking up the lighting of stations and the offices, workshops, depôts, &c., connected with them, and then describes the arrangements for lighting the rolling stock. As in the case of the public thoroughfares, he lays down the conditions for ensuring a good installation, gives details of the plant required, and offers some observations upon maintenance. He shows how usefully the incandescent system can be employed in the case of lamps bearing the names of stations or any other inscriptions, and gives an interesting account of the lighting, by means of Welsbach burners, of the stations on the various French lines of railway. This is followed by details of the systems employed by the different companies for lighting the carriages. The first trials were made by the Société Française d'Incandescence par le Gas (Système Auer) in 1893; the Paris-Lyons-Mediterranean Company showed the value of the system; the Eastern Company solved the problem; and the Western Company have put the finishing touch to train lighting by the introduction of inverted burners. In this connection, the author speaks highly of the Fournier pressure regulator, which has been adopted by the Western Company for all their carriages lighted by incandescent gas; and the Lyons Company are about to follow their example.

The final chapter in the book is devoted to coast lighting. M. Lévy relates how the trials of compressed rich gas on the incandescent system were unsatisfactory, inasmuch as, at ordinary pressures, the light furnished was little better than that afforded by double-wick burners using mineral oil. The French light-house authorities therefore decided to compress the gas, and supply it in this condition to a No. 2 Welsbach burner. The first practical application of the system was made at Royan in 1895, and was highly successful. On Jan. 1, 1900, there were seven lighthouses fitted with incandescent burners using oil gas;

* "L'Éclairage à l'Incandescence par le Gaz: Ses Applications à l'Éclairage des Villes, des Chemins de Fer, et des Côtes." Par Paul Lévy, Ancien Élève de l'École Polytechnique, Ingénieur Civil. Paris: Publications Scientifiques et Économiques; 1905.

and the author says there would by this time have been many more if the authorities had not obtained some very satisfactory results with compressed petroleum. This system of lighting he then proceeds to examine, and afterwards makes a useful comparison of the three systems—viz., wick lamps, rich gas burnt with a mantle, and petroleum vapour used in the same way. He gives the palm to the second system for safety. A few remarks on the use of acetylene gas for lighthouse illumination bring the chapter to a close.

In his concluding observations, M. Lévy points out that though important results have been achieved with incandescent lighting, it must not be supposed that the last word has been said. The road is open to inventors; and every day witnesses the introduction of improvements. This fact, and the exigencies of the printing press, must account for whatever omissions may be noticeable in the book. But, on the whole, the author has presented a very good account of the progress of incandescent lighting. The text is illustrated by 127 diagrams, of which an alphabetical list is given; and there are eight large plates. An index facilitates reference to the contents, the whole of which is of a very readable character.

A MUNICIPAL INCOME TAX.

In connection with national finance in this country, the income-tax has perhaps come to be regarded as a necessity, though it is an impost that has never been taken kindly to in many quarters. But however this may be, it is a little alarming to find such a method of money raising advocated in connection with municipal affairs. Yet such an innovation is regarded by Mr. F. Brocklehurst, the President of the Manchester Statistical Society, as a "necessity of the age"—along with the rating of urban land values. In a paper on the "Growth of Municipal Expenditure," he pointed out the position of Manchester in this respect. He said that in the twenty years to 1904 the rates of the city were nearly doubled. But this, of course, is not all; for in the same period the amount yielded by a penny rate also increased enormously. Stated in percentage of increase, the rates advanced 95·96 per cent.; while the production of a penny rate grew by 53·87 per cent. In the year 1885, the total amount raised by the rates was £342,859; while in 1904 it reached the figure of £1,029,464, or an increase of 200.25 per cent. Per head of the population, 81·64 per cent. more was paid in rates in 1904 than was the case twenty years previously. In other words, while each man, woman, and child in Manchester paid £1 0s. 3¾d. to the upkeep of the city in 1885, these several persons paid £1 16s. 10¾d. in 1904. It is, however, only fair to point out, as Mr. Brocklehurt did, that, if the increases in the education rate and the Manchester Ship Canal rate were added together, they would account for nearly half of the total increase of the rates of the city for the last twenty years; and neither of these items could be in any way traced either to bad finance or to municipal extravagance.

Looking at the matter altogether, he says he is forced to the conclusion that it is reasonable to assume that rates will not decrease in Manchester, and that whether they are to remain stationary will depend entirely upon the oversight that is shown in respect to capital expenditure. Thus he is led to assert that new sources of income must be found; and, among other things, he gives it as his opinion that the gas undertaking might return more than it does to the national exchequer. This, of course, is advocating an increase of indirect taxation; for the whole of the additional income would have to be derived from the portion of the ratepayers who were users of gas. The department already hands over a sum of £50,000 or £60,000 a year in aid of the rates; and the consumers might be pardoned if they considered this a sufficiently handsome contribution. So long as the municipal income is derived from direct rating, the citizens do at least know what they are paying for their privileges.

In the course of a subsequent discussion, Mr. F. Platt-Higgins, M.P., said it was all very well to look to the Gas Committee to make a profit for the relief of the rates; but a corporation could exercise a monopoly as tyranically as any individual. He advocated the adoption of a statutory form of accounts, as recommended by the Parliamentary Committee on Municipal Trading, which would show, in connection with the "reproductive undertakings," whether or not depreciation was duly charged. The ratepayers will get a clear idea of the magnitude of the city debt from a statement made by Alderman Holt, that the amount the Corporation have to provide for interest and sinking fund is upwards of £1000 a day. He regards as the pith of the whole question the growing amount that has to be paid year by year as interest on borrowed money. Perhaps the prospective victims of the municipal income-tax will derive some consolation from Alderman Holt's opinion that there is no reason why the rates should not be reduced, if businesslike control is exercised.

The Question of London Traffic.—In answer to an inquiry from Sir Henry Oakley, the Chairman of the Central London Railway, Sir Francis Hopwood, of the Board of Trade, has been authorized by the President (Lord Salisbury) to state that the Government have sanctioned the preparation of a Bill relating to London traffic, as recommended by the Royal Commission.

OBITUARY.

It is with much regret that we announce the death of Mr. H. S. Elworthy, which occurred on the 8th inst. at his residence at St. Albans. It will be fresh in the recollection of our readers that in the "Journal" for the 3rd ult. we gave copious extracts from the specification of his recent patent (taken out conjointly with Mr. Williamson) for a method of concentrating energy in coal gas, and called attention to the salient features of this and his preceding invention. In recognition of this appreciation of his work, Mr. Elworthy, from his bed of sickness, wrote the letter which appeared in the next issue, announcing further developments as a result of his continuance in experimental investigation. The four years' illness therein mentioned was the result of disease contracted while engaged in India upon his professional duties. The manufacture of carbonic acid and its compression into the liquid form was carried out by him (upon a method devised and patented by himself), in Bombay and in the Punjaub. The success which attended his system there encouraged him to labour for its introduction into Europe; and in this he was supported financially by those who had experience of his Indian operations. It was an improvement upon the ordinary plan of abstracting carbonic acid gas from the products of combustion of coke fires, and consisted firstly in the manufacture of water gas, and secondly in the conversion of the carbon monoxide into dioxide by passing over copper oxide; while the removal of the hydrogen furnished the means of regenerating the oxide. It was doubtless his thorough study of this class of work that led him to the consideration of the reactions between hydrogen, the oxides of carbon, and nickel, as the type of a good catalytic agent, which he proposed to apply in the ways described on a previous occasion. It will be seen from this very brief sketch that the quiet, unobtrusive, useful labours of Mr. Elworthy met with the appreciation of those who were well qualified to judge of their worth; and it is with sincere regret that we note that the buoyant hopefulness as to the success of his gas projects which was evident in his last illness is now beyond his realization. We hope, however, that the good work begun will not be neglected, but that those who are engaged, whether as individuals or as gas companies, in developing the inventions, will go on to discover the abiding value of his proposals.

Manchester District Institution of Gas Engineers.

As already announced, the Manchester District Institution of Gas Engineers will meet next Saturday at Stockport, when, by invitation of the Chairman and members of the Gas Committee, there will be an inspection of the Portwood Gas-Works. By the kind permission of the Mayor, the subsequent meeting will be held in the Court House, and tea served in the Police Parade Room. After electing the President, Officers, and Committee for next year, and new members, there will be submitted to the meeting some proposed alterations in the rules of the Institution. It is suggested that Rule 1 shall read: "This Institution shall consist of members and associate members. The qualifications of each shall be as follows: Members.—Resident engineers or managers of gas-works, and gas engineers solely employed as consulting engineers and not engaged as agents for any trading or manufacturing firm. Associate members.—Assistant-engineers or assistant-managers of gas-works making five hundred millions or more per annum. Only the members of the Institution shall have a vote at any of the meetings of the Institution." At the beginning of Rule 14, it is proposed to insert: "A list of all members in arrear with their subscriptions will be posted in the meeting-room at the annual meeting." The next item on the *agenda* is the election of a District Representative. After this there will be a paper by Mr. Thomas Newbigging on "The Price of Coal Gas to Possible Users of Suction Gas and Others;" a discussion of the address delivered by the President (Mr. S. Meunier) last February; a discussion of the "Question-Box" answers; and a paper by Mr. H. Kendrick, entitled "Notes on a New Purifier Grid and Purifying Materials."

Natural Gas in the United States.—In the last number of the "Journal," we contrasted the value of the natural gas produced in the United States in the two years ending December, 1903 and 1904; the figures being $35,815,000 and $38,496,760 respectively. The bulk of natural gas represented by the last figures (which are equal to about £7,699,352 sterling) displaced coal, wood, and other fuels, valued in the aggregate at £8,682,240. The average price of natural gas to consumers is 16 c. per 1000 cubic feet. At the close of 1904, there were 52,152,123 yards, or 29,632 miles, of mains for the transportation of natural gas in the United States. They vary between 2 inches and 35 inches in diameter; the greater portion being 8-inch and 10-inch. The line pressure on pipe up to 10 inches runs as high as 400 lbs.; for 20-inch pipe, it is usually less than 300 lbs. Originally the pressure in the wells was sufficient to transport large quantities of gas in ordinary-sized pipes to points of consumption many miles distant; but in numerous instances during recent years the gradual falling off of the natural pressure has made it necessary to put up powerful pumping or compressing machinery.

THE NEW GASHOLDER OF THE IMPERIAL CONTINENTAL GAS ASSOCIATION, AT MARIENDORF, BERLIN.

The following is an account, derived from the pages of the "Journal für Gasbeleuchtung," of the preparatory arrangements for the erection of a new holder at the Mariendorf Gas-Works, near Berlin, of the Imperial Continental Gas Association. The holder has a capacity of 150,000 cubic metres, or about 5,297,500 cubic feet, and is the largest yet erected on the Continent of Europe. The Berlin-Anhalt Engineering Company are the Contractors for the erection.

Transport of the Materials of Construction.

Special provision was made for the transport of the ironwork from the works railway to the site of the holder, in view of the great weight and large quantity which had to be handled. The object was to unload the railway waggons rapidly and without doing damage, as well as to transmit the materials quickly and safely from the unloading place to the site of the gasholder.

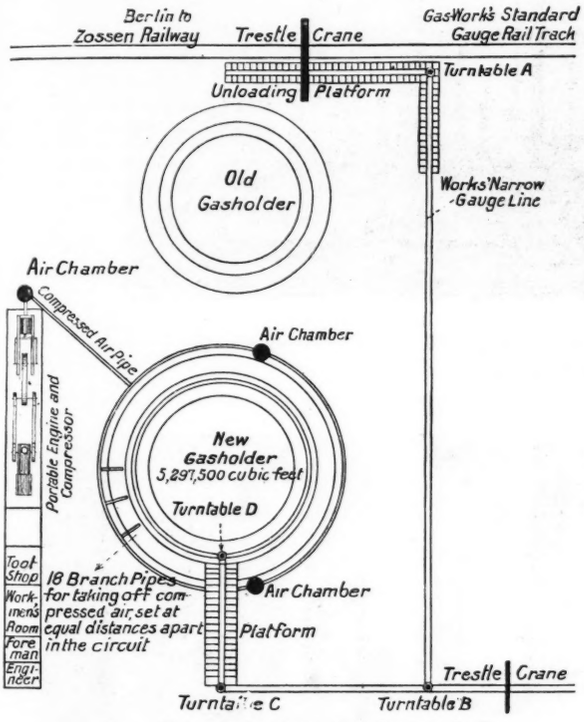


Fig. 1.—Plan of the Site.

This was accomplished in the following manner. The gas-works property is bounded on the west side by the Berlin-Zossen Railway. The waggons arriving thereby from the Moabit station were drawn by the gas-works locomotive into the immediate vicinity of the old gasholder, shown on the plan (fig. 1). The works narrow-gauge line runs on the unloading platform parallel to the standard gauge railway track. The ironwork is loaded into the narrow-gauge trucks by means of a trestle crane (erected over both these lines) and a windlass, and is then conveyed to the building site of the gasholder.

If ironwork which is not required until a later stage in the construction is delivered, the works trucks are turned, by means of the turntable B, into a siding, where they are unloaded. The ironwork is then arranged there in the order in which it will be used. The arrangement of the works railway is shown in the plan. The turntable C is at the base of the inclined platform leading up to the gasholder embankment. On the latter, a line runs all round the holder. It was thus possible, without any great expenditure of time and power, to convey even the heaviest pieces of the work conveniently and quickly to any part of the holder where they were required.

The Compressed-Air Plant.

The component parts of the guide-framing were raised and placed in position by means of compressed air, which was also applied for the whole of the riveting, including the rivets in the first row of the roof-sheets (fig. 6), with the exception of the cold riveting on the crown. The compressed air was supplied by a Franklin compressor, having a capacity of 233 cubic feet of compressed air per minute. A 40-horse power Wolff's portable engine was used for driving the compressor. The compressed-air pipe runs from the engine-house to the embankment base, and thence all round the latter. It is made of 2-inch gas-barrel, and three air-chambers are provided in order to avoid undue fluctuations of pressure.

At eighteen points, at equal intervals round the circumference, strong branches, $1\frac{3}{5}$ inches in diameter, were connected with the compressed-air main, and carried up from the base to the top of the embankment. The free ends of these eighteen branch-pipes were provided with valves and a flexible connection, so that a flexible pipe could be at once connected up at any required position in the circuit of the holder, and the supply of compressed air obtained there. The compressed-air main was given a slight fall towards one side; and at its lowest point a sump was provided, from which the water which collected was removed several times a day while the main was in use.

Erection of the Guide-Framing.

A special crane was constructed for the erection of the parts of the guide-framing. It was decided to put up the guide-framing first—thus departing from the practice of English and American engineers, who erect the guide-framing after the bell has been finished. The crane perfectly fulfilled the purpose for which it was designed. It travelled on railway metals on the gasholder embankment at a distance of about a yard from the wall of the tank. It was 138 ft. 6 in. high; and the height of the standards of the framing, each of which was in four lengths, was 127 feet. The bottom and heaviest length weighed about 4 tons.

For raising this load, a compressed-air windlass, attached to a transverse girder of the crane, was used. It exerted normally a lifting power of 1 ton; but by means of pulleys, this could be increased to 4 tons. The disposition of the compressed-air main and branches, already described, admitted of pneumatic power being available at each position to which the crane was shifted as construction advanced. Thus it was possible, on each working day, to raise into position six or seven sections of the framing.

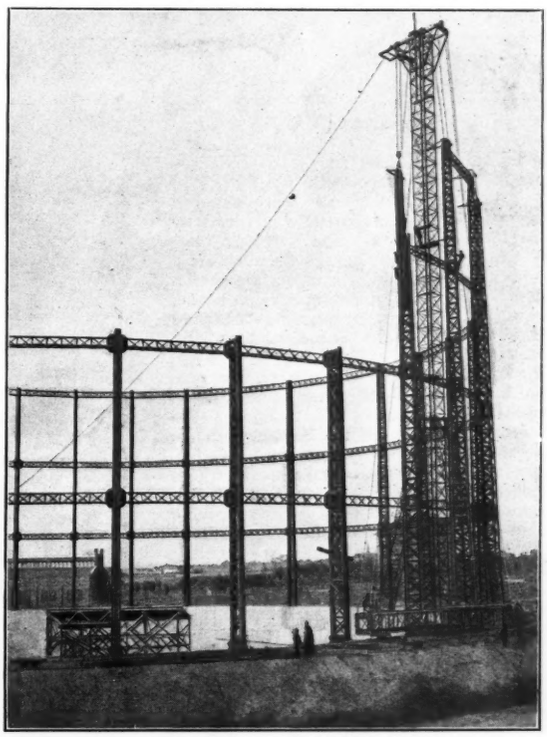


Fig. 2.—The Erecting Crane, raising Parts of the Guide-Framing.

Thus the whole of the guide-framing, which, including the lattice girders, comprised 256 sections, without counting tie-rods, was entirely erected in 40 days.

Riveting the Joints in the Guide-Columns.

The absence of galleries round the holder made it seem difficult, at first sight, to properly rivet all the joints in the guide-framing. The use of a flying scaffold would have been very dangerous, owing to the height of the guide-framing; and it would have entailed the expenditure of much time. The joints were riveted by pneumatic power; and for the topmost joints flexible piping for the compressed air, 115 feet in length, would

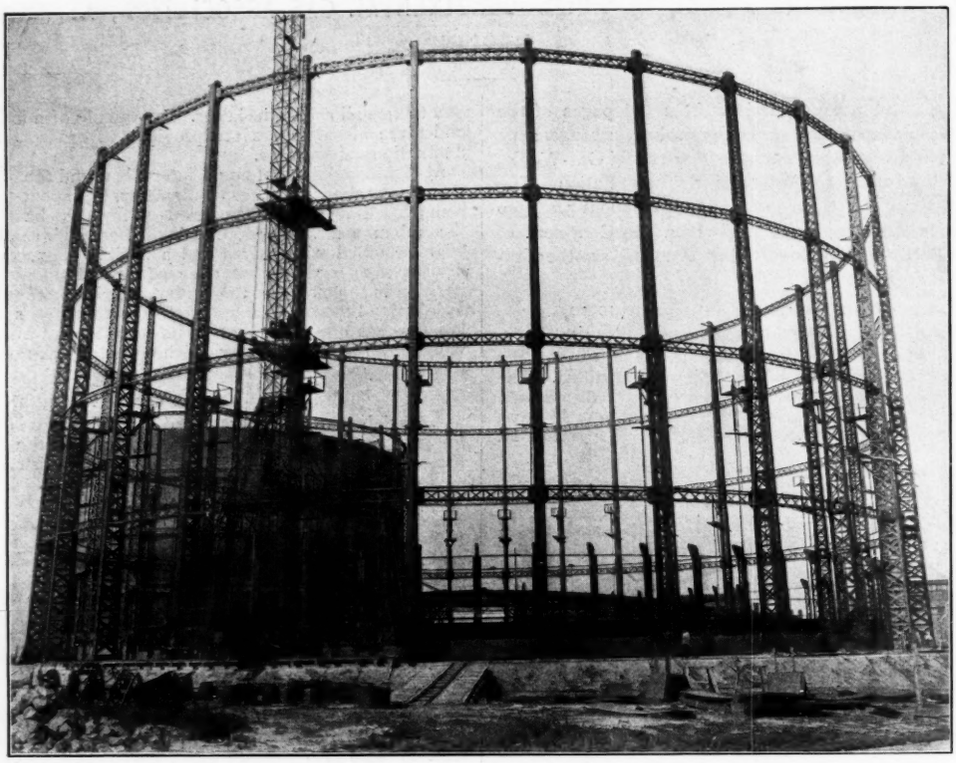


FIG. 3.—PLATFORMS FOR RIVETING THE JOINTS OF THE FRAMING AND THE SUSPENSION OF THE BELL FROM THE LOWERING APPARATUS.

have been required. The use of the crane overcame all these difficulties. The crane was drawn in front of the guide-column which was to be riveted, and its standard was connected at the levels of the three joints with the lattice-work by means of strong beams. The latter were covered with 1¾-inch planks, and held in place by squares; so that a very firm and safe platform, to which a strong railing was fitted, was obtained. These platforms are shown in fig. 3. They afforded ample room for six workmen. The portable forge was attached to the outside of the crane standard by means of iron bars.

A gas-pipe, 2 inches in diameter, was provided for the supply of compressed air. It was attached in the angle to one of the four iron angle-irons of the crane standard, and extended to the topmost row of joints. Opposite the joints were branches, to which the flexible connections for the riveting hammer and rimer, as well as for supplying the blast to the portable hearth, could be attached. After the three joints of a guide-column had been riveted, and it was necessary to move the crane, all that had to be done was to release the flexible connection between the vertical pipe and the compressed

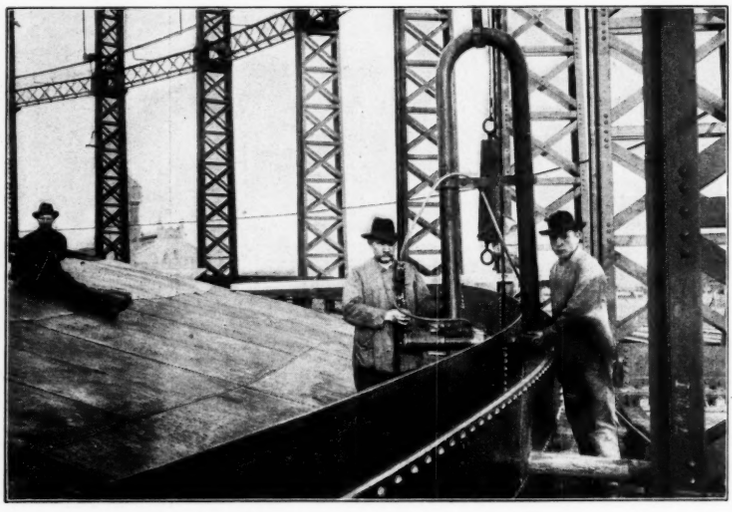


FIG. 5.—RIVETING THE CUP JOINTS AND THE HOLDER CROWN.

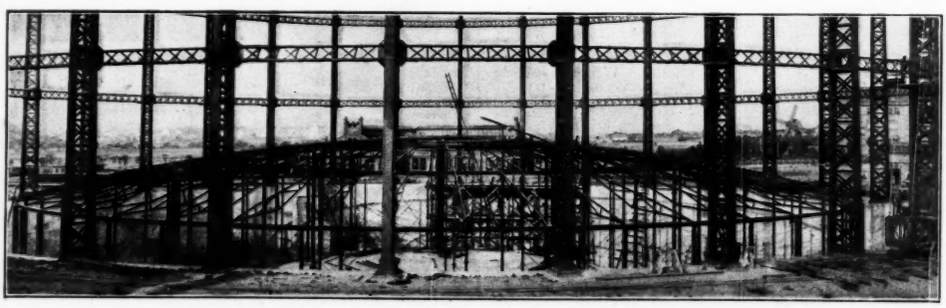


FIG. 4.—THE FRAME FOR THE BELL BEFORE PLATING.

air service, and to slide back the platform. This arrangement answered extremely well; and the riveting proceeded quickly and safely.

Constructing and Riveting the Bell.

The cups and side sheets were put together in the following way: Brackets of angle iron, with removable horizontal arms, were attached to the base of the guide-columns and to the head of the intervening guide-rails, at the same height as the top of the tank, as shown in fig. 6. The cup-ring was laid out concentrically on these brackets, and its joints were there riveted. The completed ring was then suspended from the 32 chains of the lowering apparatus, and the horizontal angle-irons on the brackets were screwed off, so that the cup was suspended freely from the chains. The first row of sheets was then attached and riveted. The rivets were hammered by a horse-shoe shaped machine, suspended from travelling-blocks. It could be moved forwards and backwards by chain-pulls. The blocks travelled on a railway, which was suspended from the lowering apparatus, and took a circular course within the framing. This railway was of the same diameter as the middle lift of the holder.

The seams of the side sheets, which were riveted in the cold, were packed with canvas; but the hot riveting was done without packing. After the sheets had been put in position, the rivet holes were drilled where required by a compressed-air machine, as seen in figs. 5 and 6. Eight riveting-machines were in operation at the same time; one machine being allocated to every four panels of the framing. It was thus readily ascertained how the different riveters' work compared in pace and quality. Some 11,000 rivets were inserted in one row of sheets; and the whole row was riveted in about two hours. Each man thus drove on the average about 690 rivets per hour, or more than 11 a minute. Two men were employed on each riveting machine; the riveter being on the inside of the holder, and the holder-up outside. The latter had to manage the anvil of the machine, and to insert the rivets in the holes. When a row of plates had been riveted in this way, it was dressed with wooden hammers, and then lowered by means of the lowering apparatus as far as was necessary for the fixing of the next row of plates. The lowering and putting in position, and the packing of the sheets, occupied more time than the riveting; but it was nevertheless possible to finish three rows in two days.

The first and second lifts were only started upon after the sides of the bell had been finished. This plan had the advantage that the crown and the first lift could be worked at together, and time thus saved. The holder was finished, including the anti-freezing apparatus and small appurtenances, by the end of February; so that it was completed in only nine months.

The compressed-air plant was used for raising the holder with air; but its delivery of about 233 cubic feet of compressed air per minute would, unassisted, have taken about 38 working days to fill the holder. In order to complete the filling in a shorter time, apparatus was devised which accomplished it in ten days. The compressed air was passed through a gas-pipe provided with a nozzle into the inlet-pipe, which was of such cross section that the compressed air issuing at seven atmospheres pressure drew free air also into the inlet-pipe. Six of these appliances were attached to the lid of the inlet-main; and it was thus possible to raise the holder in the short time stated.

The travel of the holder, both in rising and falling, was observed by means of a special registering apparatus. It was thus ascertained that the holder rose and fell evenly, quietly, and without jarring.

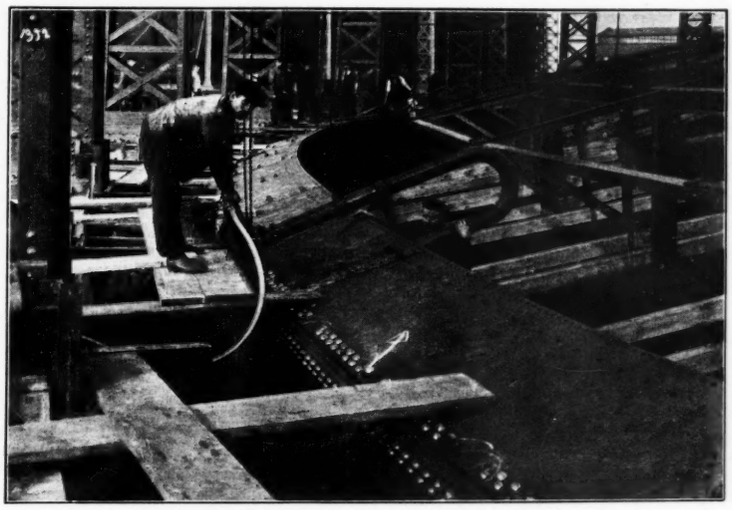


Fig. 6.—Riveting the First Row of Crown Sheets and the Brackets for Setting-out the Cups.

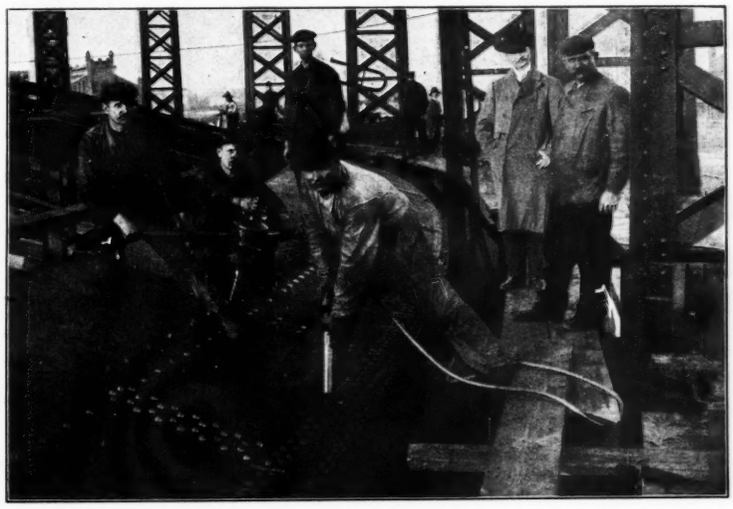


Fig. 7.—Riveting the Outer Edge of the Crown.

THE SCIENTIFIC STUDY OF FUELS, INCLUDING COAL GAS.

The Council of the University of Leeds have appointed Dr. W. A. Bone, F.R.S., as Professor of Applied Chemistry (Fuel and Metallurgy). This appointment marks an important departure in the work of the University. The teaching of the subject of metallurgy has been developed to a considerable extent in some of the newer Universities—notably at Sheffield and Birmingham; but it has not hitherto been seriously undertaken in the University of Leeds.

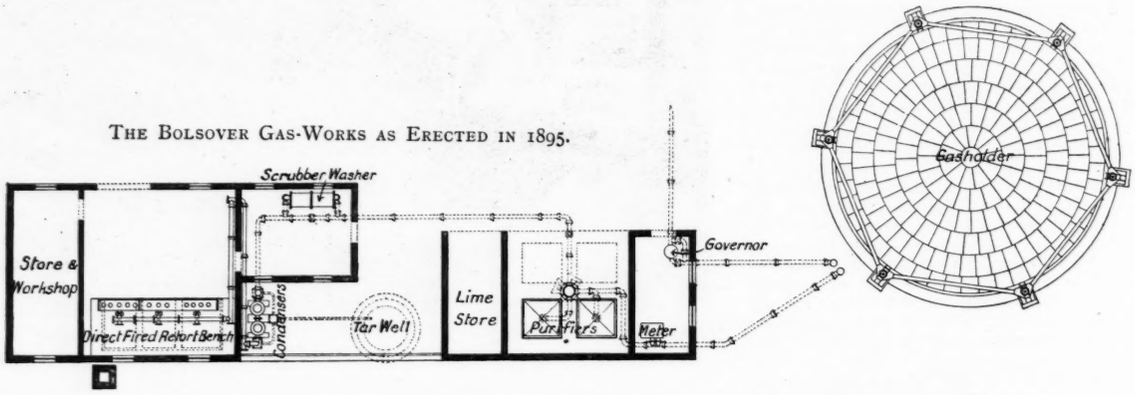
The post just created is intended to include the subject of general metallurgy, which forms part of the course of study for mining and engineering students; but it is intended to specialize the new department at Leeds in the direction of fuel and its applications—a subject that is of rapidly increasing importance at the present time. Processes such as the coking of coal, the manufacture and uses of power gas, and the utilization of fuel of all kinds have led to a great demand for scientific knowledge and research. It is also intended that the new department shall concern itself with the manufacture and use of coal gas, and that it shall, in fact, take its place as a School of Applied Chemistry in relation to fuel, side by side with the already existing departments of Applied Chemistry in relation to dyeing and to the leather industries.

Dr. Bone received his scientific training at the Owens College, Manchester, and at the University of Heidelberg. He is a late Fellow of Owens College, Doctor of Science of the Victoria University, and a Doctor of Philosophy of Heidelberg. He has been engaged during the last seven years in teaching Chemistry and Metallurgy at Owens College. He has carried out numerous scientific researches on the subject of combustion, in recognition of which he was last year elected a Fellow of the Royal Society. He has also devoted considerable attention to practical problems of an industrial character in relation to fuel and metallurgy, more especially in the Cleveland district of which he is a native.

A new building to accommodate the Mining Department is about to be erected by aid of a fund raised by those interested in the mining industry of the district, and, in this building, laboratories will be provided for the new metallurgical work.

THE NEW GAS-WORKS AT BOLSOVER.

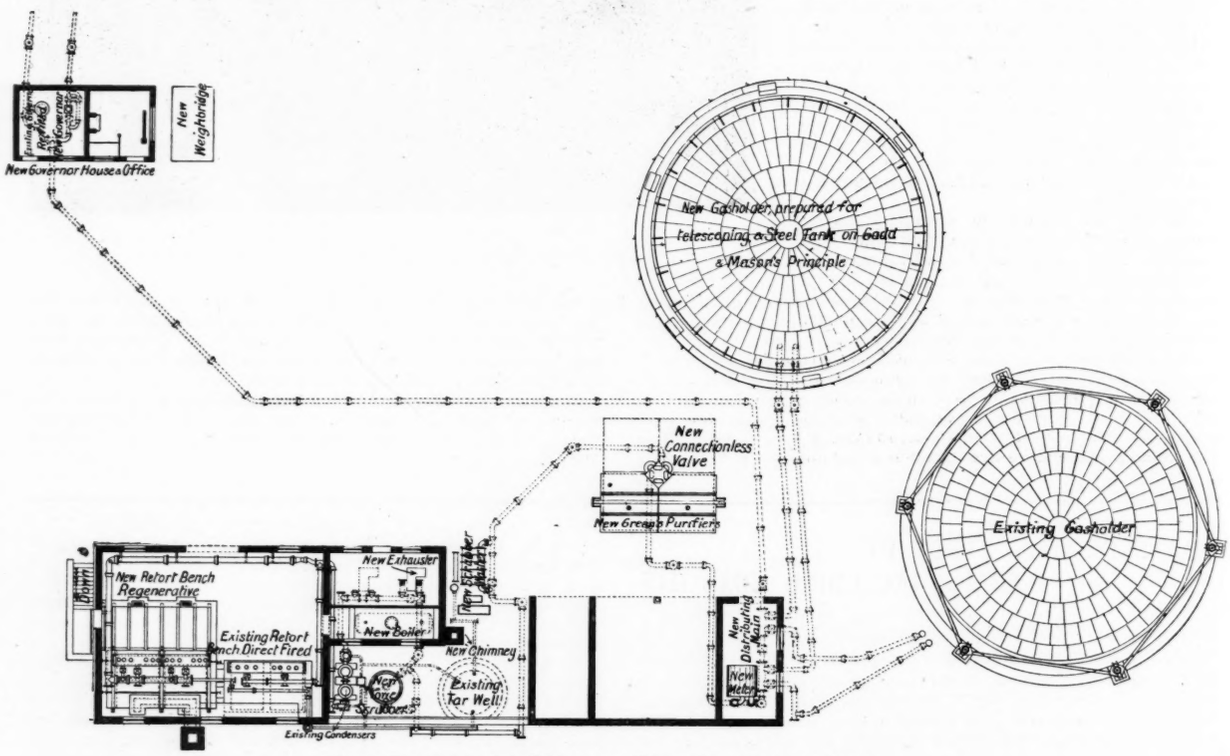
In the year 1895 a new Company was formed, and a gas-works built at Bolsover, near the Midland Railway Company's station (as per plan herewith), designed so as to be capable of manufacturing a maximum output of from five to six million cubic feet of gas per annum. Recently, the adoption of penny-in-the-slot meters, the free fitting-up of houses, &c., has considerably increased the demands made upon the Company for gas; and, with a view to meeting these demands, it was found necessary to enlarge and entirely remodel the gas-works. Last year, the Company called in Mr. E. J. Brockway, of Cleethorpes, under whose advice alterations now to be described have been carried out most successfully.



The Bolsover Gas-Works as Erected in 1895.

The retort-house has been rearranged, and two settings of sixes have been put down, heated by "Waddell's" patent regenerators. A new large foul-main has been taken round the retort-house, so as to assist the condensers, which remain unaltered. When the works were first built, a rotary scrubber was put into a building now utilized as an exhauster house. This washer has been replaced by a larger one fixed in a shed outside; and in the house have been erected a steam-boiler and a direct-driven rotary exhauster, combined on one bed-plate, as shown on the plan. New scrubbing, purifying, measuring, storing, and governing plant have also been added. The scrubber is 5 feet in diameter by 30 feet high, filled with boards. The new rotary scrubber is of 150,000 cubic feet per diem capacity, driven by a steam-engine. The purifiers—two in number—are 10 feet square by 5 feet deep, worked by Robert Dempster and Sons' patent connectionless centre-valve arranged so that two additional purifiers can be added with a minimum amount of inconvenience when required. The lime purifiers have been taken out; and the shed will be used as an oxide and lamp store. In the building containing the new station-meter, valves are arranged to control the two gasholders. The new gasholder is 50 feet in diameter by 16 feet deep. It is on the spiral system; and is prepared for telescoping. The tank is of steel, and practically above ground. A new governor house and office have been built. The existing governor has been refixed, and a new one added, to enable the Company to divide their district, so that they may be able to deal independently with the high and low lying parts.

The whole of the alterations here referred to have been carried out by Messrs. Robert Dempster and Sons, Limited, under Mr. Brockway's supervision. The alterations practically comprise the building of a complete works, and add another to the already large number of complete gas-works erected by the Elland firm.



The Bolsover Gas-Works as Reconstructed in 1904-5.

At the opening meeting of the 87th session of the Institution of Civil Engineers, a fortnight ago, Sir Guilford Molesworth, K.C.I.E., the retiring President, alluded to the loss the Institution and the engineering profession generally had sustained during the recess by the deaths of Mr. James Mansergh, F.R.S., and Mr. George Robert Stephenson, Past-Presidents, and of Sir William Shelford, K.C.M.G., Member of Council. He formally introduced his successor in the chair, Sir Alexander R. Binnie, who delivered an address, in which he traced the influence of scientific thought and investigation upon the development of engineering practice. He subsequently presented the medals and premiums awarded by the Council for papers dealt with in the course of the past session, and afterwards held a reception of the members in the library.

AMERICAN GASLIGHT ASSOCIATION.

The Presidential Address.

In a previous issue of the "JOURNAL" (*ante*, p. 394), we noticed generally the proceedings at the thirty-third annual meeting of the American Gaslight Association, which was held in Milwaukee (Wis.) from the 18th to the 20th ult., under the presidency of Mr. E. G. Cowdery, of St. Louis, the Vice-President and General Manager of the Laclede Gas Company. We give elsewhere one of the papers read; and the following are some extracts from the President's address.

After a few introductory remarks of a personal character, in the course of which Mr. Cowdery stated that the present year marked the twentieth anniversary of his connection with the Association, he proceeded to lay before the members his opinions on some of the leading questions of the day; taking up first the price of gas, as being one of the most urgent at this juncture. He said that when gas is sold at $1 per 1000 cubic feet, he did not wish to impress anyone with the idea that there was need for a lower price; but as the opinion seemed to prevail that corporations serving the public could sell their product at constantly lowering rates, he thought it was time for gas people to meet the question in such a way that the public would thoroughly understand it. It was often claimed that the lower the price of gas, the greater the amount of the business to be obtained, and that this would make possible the accumulation of a larger aggregate profit. The extent to which the consumption would be increased by a lower price had been in a great measure an unknown quantity; but at present he believed this factor was fairly well established. Through the great range of price of artificial gas during the last thirty years, from $4 to $1 per 1000 feet, and of natural gas from 50 c. to 7 c., the almost universal average of consumption was $40 worth of gas per consumer per annum; the lowest figure being about $25, and the highest $55. With these figures at hand, and knowing the average investment per consumer, the cost of production, maintenance, and operation, making due allowance for the possible deviation from the average cost and for depreciation (which, sooner or later, must be taken into account), it should not, said the President, be very difficult to determine the possibilities of the situation. But he thought it should not be lost sight of that the figure so determined would only be obtained by unusual good judgment, and with care, thought, and close attention; and therefore it would be considered for some time to come an experiment, with doubtful results, whenever the price was reduced below $1 per 1000 cubic feet. In their endeavour to reach the lowest possible figure with the greatest measure of success, even the larger cities must, in his opinion, recognize the fact that in serving consumers using less than $1 worth of product per month, there was no profit. Care should therefore be exercised to keep this consumer on a basis of paying his own way, and not of dependence upon the large consumer to make good the deficiency caused by the small one.

The next subject dealt with was publicity in connection with gas supply. The President expressed the belief that many of our present troubles had come from lack of knowledge and appreciation on the part of the public of the methods employed by gas companies in the conduct of their business. The companies were perfectly honest in the measurement and charging of their product; they were honest in the treatment of the public, and in conducting their business in a strictly legitimate way; and they wished only a proper profit upon their investment. But it should, he thought, be borne in mind that they were entitled to, and should have, a sufficiently increasing profit where unusually good service was accomplished to furnish the necessary incentive to produce greater results in the future. If the incentive was insufficient or was removed, the ambition was killed; and the public should, and he believed would, through any extended time, reward the individual or corporation who showed the proper spirit towards the public in the management of the concern. How, he asked, could the public be expected to know or appreciate gas suppliers' efforts unless they were made known? If the public were met in a spirit of frankness, they would believe in gas people in matters where it was necessary for them to exercise confidence. But abuse their confidence once, and it might be gone for ever. There seemed to him that there was little to be lost and much to be gained by allowing, and even encouraging, the public to become acquainted with all the facts. Personally, he believed in publicity on the part of all public-serving corporations; and if it ever came about that the results of their efforts and operations were published broadcast, the greater portion of their troubles would have disappeared. He was not a believer in State Commissions, as established by law in Massachusetts, and more recently in New York. In his opinion, they served to retard and obstruct the development of the business they were supposed to control, because the laws governing such bodies were too stringently framed. Publicity, with good management and due regard for the rights of the public, would, he thought, prevent any need for State Commissions.

Turning his attention to the manufacturing branch of the business of gas supply, the President offered a few remarks on condensation, which he thought deserved more study than has been given to it. In his opinion, there is much that is still unknown on this subject. It was undoubtedly true, he remarked, that the higher the illuminating power of the gas the higher should be the effective heat units; but how many managers, he asked, followed up this subject with their photometers and calorimeters at every step of the process of condensation and purification, to see whether these conditions always ensued. He said that where he had seen this work carried on he had observed at times the higher illuminating value in conjunction with the lower heat units, and *vice versâ*; so that it appeared there was a constantly changing chemical combination of gases producing the different results. Was it caused in the manufacturing process, or during the condensation or purification? Gas managers were all agreed that they must bring their gas not only to the highest possible efficiency in heat units, but keep such heating effect constant and regular. They were approaching the day when candle power must be relegated to an inferior position to heat units; and to replace the laws now governing candle power, they must be able to produce better results for the consumer in other ways. The condensation of gas was one of the great problems before them; and it was to be hoped that in the early future the subject would have the study and attention it deserved.

Passing on to distribution, the President emphasized the importance of not allowing the plant to become outgrown; for having once fallen behind, the cost of putting the system into shape was so alarming that it was often difficult to secure the necessary grant of capital for the work. On the subject of the compression of gas, Mr. Cowdery made the following remarks: For some years we have heard discussion at various times on the subject of the distribution of gas under high pressure. We all know that when illuminating gas is subject to too high compression, there is a percentage of loss of the illuminating effect. The limit of compression is, therefore, when the loss is compensated by the benefits derived. So far as our practice has obtained at present, such limit is from 30 to 40 lbs. per square inch. At this pressure, neither the illuminants nor the heat units are materially affected. There is, however, an intermediate system, which provides for the compression of gas in large quantities at a lower cost per unit than is possible under the high-pressure system. This is known as the "booster" system, and is more properly applicable in our larger cities—being used as a feeding system to supply the old outgrown distribution system with a sufficient quantity of gas at an adequate and equal pressure. The pressure at which such a system is operated is usually from 5 to 6 lbs. per square inch; or, in other words, as high as can be most economically obtained with the rotary blower. In future years, we shall hear much more of high-pressure distribution, with the gradual passing into obscurity of our old low-pressure systems. By no other than some high-pressure system can we hope to give to every consumer the even and constant pressure he requires, and make the service satisfactory. To those who have doubts of the wisdom of handling gas under high pressure, I would say: Give sufficient time to a thorough investigation, and allow yourself to judge of the results as you see and find them, after having freed your mind of all prejudices concerning the subject.

Before leaving the question of distribution, the President made a bold defence of the much-abused gas-meter. He said: That the gas-meter as it exists is an honest and correct measurer of the product it passes, is shown by the fact that in this world of progress there has been no remarkable change or improvement in the meter, and no change in its principle for the last forty years. I have known parties of more than the usual amount of originative and inventive ability that during this time have constantly tried to produce an instrument simpler and more perfect than the present meter; but they have failed to do so. Nowhere in this wide world, during that time, has an instrument been devised that was more accurate for the purpose than the common and long-known tin gas-meter. There have, of course, been improvements in the details of the manufacture of the meter, and there is now, I believe, a movement to further perfect the meter, which will have a tendency to cheapen its cost per unit of capacity, and which will put into the consumer's premises an instrument that will give better service throughout the entire time of its use. Yet there is no change in the principle of the meter. Why, then, should there be so much ridicule of it? Suppose we tell all these facts to the public as we tell each other, and as we know them ourselves, would it not have the tendency to establish confidence in the little much-abused instrument?

The next subject dealt with was municipal ownership, which the President said he intended to have thoroughly discussed at the meeting, as a paper would be submitted upon it. While the paper contained a great deal of information, he was sorry that it was insufficient to enable an actual comparison to be made between municipally-owned and private companies. He urged upon the Association to adopt means at once to continue vigorously the study of the question, and collect all the facts connected with the successes and failures of plants municipally-owned and operated. Such facts and figures, correctly compiled and truthfully presented, would themselves combat all the arguments of the theorists in favour of municipal ownership. While European were not to be compared with American methods, on account of the difference in the system of municipal and general government, he believed that if all the details of costs, with the general conditions surrounding plants which were municipally governed, were entered opposite the same details concerning some privately-operated plants, they would not show so favourably for the municipal plants as some would try to make people believe. At present, they had

not the details and facts concerning these plants, and they were not obtainable unless someone made it a specific work to collect them and put them together. The Association could not do a better work than find the way to procure this information for the benefit of all. He was quite sure that with a little effort the necessary funds could be obtained.

The President then proceeded to deal with the requirements and remuneration of the Secretary, the work of the Research Committee, and the proposed consolidation of the various Gas Associations in America. In connection with the last-named subject, he said the Committee appointed by the Association had made a report which would be submitted to the meeting; and he asked for its consideration upon its merits, without prejudice. They were all, he said, working for the common good; and only such action should be taken as would result in common benefit, and be adapted to the growing needs and usefulness of Association work.

The address closed with a reference to the members who had passed away since the preceding meeting.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the St. Helens Gas-Works.

The members of the Association on Saturday paid a visit to the St. Helens Corporation Gas-Works; permission having been kindly granted at the request of Mr. S. Glover, the Engineer and Manager. The members were met at the works by Mr. Glover; and, after a few words of introduction, they were conducted through the various departments.

The first place visited was the retort-house, containing horizontal retorts worked by West's manual stoking-machines, each being able to deal with about 14 beds. The men all work together, and are paid on the tonnage. From the retort-house the members proceeded to the tar-distilling works and the exhausters and purifying houses. They were greatly interested in the naphthalene process, which has been worked very successfully at St. Helens. Eight years ago, there was so much trouble from naphthalene that the Engineer determined to solve the problem; and this has been so completely accomplished by the Young and Glover process, that for between four or five years the town has been quite free. Each of the manufacturing departments was visited, and the details fully explained; much interest being shown by the visitors in the system of purifying, and the thoroughness with which the work was done, especially when it was explained to them that the sulphur compounds tested regularly were under 10 grains per 100 cubic feet. Lime is the purifying material; the waste being sold to the local farmers, who keep up a very brisk demand for it. In connection with the purifying operations, Mr. Glover's lime-preparing apparatus was shown and explained by him by the aid of drawings and some portions of it which had been already delivered; permission having been given by the United Alkali Company, the owners of the patent.

The visitors were afterwards conveyed in carriages to the gas-holder station, where the enlargement of the holder is just being completed by Messrs. Clayton, Son, and Co., Limited, of Leeds. The work consists of the addition of a flying lift, which will add 500,000 cubic feet to the capacity of the holder. The guide-framing having been strengthened by new diagonal bracings, the columns fitted with stronger and deeper guides, and the weight of the holder increased by the addition of a complete ring of cast-iron weights attached to the bottom edge of the inner lift, it is capable of delivering gas to the last sheet at sufficient pressure to supply the largely growing district at that end of the town.

It may not be out of place to state, in connection with the Gas Department of the town, that there has been a gross capital expenditure of £308,900 upon the gas-works, which were purchased from the St. Helens Gas Company in 1878. Of this amount, there has been paid off a sum of £158,630; so that at present the debt of the Gas Department amounts to £150,270. When the Corporation took over the works, the price of gas was 4s. per 1000 cubic feet; whereas now it is only 2s. 2d.

At the close of the inspection, the members were conveyed to the Town Hall, where tea was provided in the Mayor's Parlour. The Mayor (Mr. H. Martin) being indisposed, Mr. Glover said they still had the honour of the presence of the Mayoress and of Mrs. Glover. A vote of thanks to the Mayor, Mayoress, Mr. and Mrs. Glover, and the assistants was proposed by Mr. H. Smith (ex-President of the Association) for the kind way in which the members had been received. Mr. Garlick seconded the vote of thanks, which was unanimously passed. Mr. Glover, in response, said he thanked the members for their kind approval of the manner in which they had been received. Any pleasure which they had found in coming to St. Helens was full recompense for whatever service he might have performed. He anticipated great pleasure in meeting them, and thought it an honour to have works with some special advantages to show them through. This anticipation had been more than realized. He would like them to note that so long as he was there to be written or spoken to, or to be of service to the members of the Association, either in their present or in any future capacity, he would only be too pleased to manifest the same spirit to them in response. In their training and experience he wished them to remember that things must be well considered before they were brought before any committee they might work for. He was strong because his Committee were devoted to the good management of the Gas Department of the town. He had always been well helped in the right direction by his Committee; and to this, and to his love of his work, as well as to the loyal assistance of his men—who, so far as they were able, would do anything for him in that true spirit of brotherliness which the members had seen—he attributed the successful working of the Corporation gas undertaking. The loyalty of the members of the Association to their present chiefs, and perseverance in doing well their respective duties, would in due time receive the reward for which they must all be hoping. He wished them health and every prosperity.

The members were then escorted to the gas exhibition which was being held adjoining the works, and this concluded the visit.

MIDLAND JUNIOR GAS ENGINEERING ASSOCIATION.

Visit to the South Staffordshire Mond Gas-Works.

The members of the above-named Association paid their second visit last Saturday, when, by the kind permission of the South Staffordshire Mond Gas Company, their works at Dudley Port Tipton, were inspected.

The members assembled at the offices of the works, and the President (Mr. F. J. Bywater), the Senior Vice-President (Mr. G. W. G. Tatam), and the Hon. Secretary and Treasurer (Mr. James Hewett) of the Association were received by Mr. W. H. Carder, the Secretary of the Company, and introduced to Mr. Edmund Howl, the Managing-Director, who expressed the pleasure it gave him to have the Association there, and said he hoped the visit would prove both interesting and instructive. The seventy members who had availed themselves of the privilege of the visit were then divided into small parties, and conducted round the works by the Manager (Mr. Mathieson), assisted by Messrs. Humpedge, Pinnock, Lindop, and Griffin, members of his staff. The Mond process was fully described in the "JOURNAL" for April 14, 1903; and an account of the works appeared in the issue for Nov. 29 last year. Commencing at the canal basin and railway sidings, where the coal is received, the members visited the various buildings and inspected the plant and machinery, finishing at the rotary meters and trunk mains, where they enter the ground and convey the gas to the districts supplied; the arrangement of the apparatus and the various processes being carefully explained *en route*. At the conclusion of the visit, the members assembled in the offices, and carried with acclamation a vote of thanks, proposed by Mr. Bywater, and seconded by Mr. C. Meiklejohn, of Rugby, to the Company for the pleasure afforded by the visit; also to Mr. Mathieson and his staff for kindly conducting the party round the works and for their interesting explanations and descriptions. In addition to Mr. Meiklejohn, there were present Messrs. T. Berridge (Leamington), J. H. Brown (Nottingham), and W. B. Davidson (Saltley), who attended as honorary members of the Association.

METHODS OF CHARGING FOR GAS.

By A. E. FORSTALL, of New York.

[A Paper read before the American Gaslight Association.]

As far as the writer's knowledge goes, this paper is the fourth one on the subject of "Methods of Charging for Gas" that has been read before the Association. The first, read in 1891,* and the second, read in 1898,† dealt principally with the question of the equity of the common practice of charging for gas at a fixed price per 1000 cubic feet, which was the same whether for all the consumers supplied by the company or for all of those in certain classes, without any regard to the differences in the cost of supplying consumers arising from the varied conditions under which the supply is taken in each case.

The author of the first of these papers—Mr. Walton Clark—submitted that it was inequitable to "collect upon the investment necessary to the service of one customer an interest greater or less than is paid by any other customer upon the investment made in his behalf," as was necessarily done when the charge for gas was simply a uniform price per 1000 cubic feet; and that the equitable way of charging for the service furnished by the gas company was "to charge for each 1000 cubic feet of gas an amount covering its proportion of the items of expense and interest common to the performance of the total service—adding to each bill so made the items peculiar to the individual service." The charge per 1000 cubic feet should comprise the cost of supplying up to the inlet of the service-pipe, including the amount per 1000 cubic feet necessary for the payment of interest and dividends; and the individual items should be made up of the average cost

* See "JOURNAL," Vol. LVIII., p. 990. † *Ibid*, Vol. LXXII., p. 1356.

of keeping the accounts, collecting the bills, and attending to the complaints, *plus* the interest and maintenance charges for the meter and service-pipe employed for the particular consumer under consideration.

In the second paper, the present writer—who was forcibly impressed, upon taking charge of the commercial, after a service of twelve years on the engineering, side of the gas business, with the number of consumers who, instead of bringing in a profit, were actually a source of loss, when the expense of taking care of their accounts and the interest on the cost and the expense of maintaining their services and meters were taken into consideration—showed the effect that the system of charging advocated by Mr. Clark would have if applied to the gas company which he was then managing. For this particular case, it was shown that the total yearly cost per consumer of the maintenance of service, interest, depreciation, and repairs on meters and labour, keeping the consumers' ledgers, making out and distributing bills, collecting the money for gas sales, and attending to complaints, was, for an average length of service but for different sizes of meters: 3-light meter, $2·25; 5-light, $2·50; 10-light, $2·90; 20-light, $3·30; 30-light, $3·80; 45-light, $4·90; and 60-light, $6·20.

Therefore, before the company came out even on the business of any consumer using a 5-light meter, it was necessary that he should burn in a year a quantity of gas that would bring in a profit equal to $2·50. If fixed charges on the amounts already named had been made, and the price charged per 1000 cubic feet of gas reduced to such an extent that the gross revenue from fixed charges and gas sold remained the same as the gross receipts from gas sales at the higher price per 1000 cubic feet without fixed charges, the consumptions at which consumers would pay exactly the same amount in each case were: For a consumer using a 3-light meter, 19,000 cubic feet; a 5-light, 21,000 cubic feet; a 10-light, 24,000 cubic feet; a 20-light, 28,000 cubic feet; a 30-light, 32,000 cubic feet; a 45-light, 41,000 cubic feet; and a 60-light, 52,000 cubic feet.

Under the existing conditions, the 63 per cent. of consumers who used smaller quantities than these were not paying their proper share of the profit earned by the company, while the 37 per cent. using larger amounts were paying more than their share.

These papers received very little attention when they were read; the authors being told that they were most probably right as to the equity of the proposed method of charging, but that their proposals were impracticable, and could never be put into operation.

The third paper was read by Mr. F. W. Frueauff, at the last meeting of the Association.* It approached the method of charging for gas along the line that had been followed by Mr. H. L. Doherty in working out the system of charging for electricity which is named after him. In this system, a prominent place is given to the cost incurred by the electric company to enable it to take care of the maximum demand of the consumer; and a special charge is made to cover this cost, under the name of a "maximum demand charge." In applying the method to the gas business, this feature is retained; and it is proposed to make a maximum demand charge in addition to the consumer's charge and to that per 1000 cubic feet of gas sold. It is stated that an analysis made of the accounts of a gas company "brought out the startling fact that 19 per cent. of all the gas consumers did not pay their output and consumer costs; that 34 per cent. did not pay their manufacturing, meter, and demand costs; and that only 34 per cent. paid all the costs they occasioned, or that this 34 per cent. paid enough in excess of a reasonable amount to enable the company to make good their loss on the unprofitable consumers. This leads to but one conclusion—that they are doing business with a great number of consumers who are causing them to lose money each month, and that they are selling them a very small quantity of gas; while from the other end of the table they found that from the comparatively few consumers who were using a large percentage of gas they were making a big profit after paying all costs." It will be noted that the percentage of consumers carrying more than their share of the burden in this case does not differ materially from the corresponding percentage as given in the second paper. To remedy these conditions, it was proposed to put into effect "an optional system of charging, whereby any consumer can buy gas by paying $12 per consumer per year, *plus* $15 per 100 feet of maximum demand, *plus* 60 c. per 1000 cubic feet for gas."

It does not seem to be necessary to repeat the arguments advanced in these papers, and never refuted in the discussions upon them, in favour of the system of charging outlined. The one advocated in the last paper read is rather more elaborate than that recommended in the other two papers; but there is good reason for making charges of the character described. No information is given, however, as to the manner in which the amount of the maximum demand charge, which is not nearly so important in connection with the gas business as it is with the electric business, and that of the consumers' charge, which are named in the paper, are determined to be the proper and equitable ones for this particular case. And, since maximum demand and consumers' charges not based on actual costs are just as inequitable, and therefore, in the long run, just as bad policy, as a simple uniform charge per 1000 cubic feet, and as these charges seem to me to be entirely out of proportion to the cost of the service, I propose to take up the question of the items that should be included in each charge, and of the approximate value of these items. In doing this, the classification of the standard system of accounts adopted by the Association will be followed.

The items of cost that are imposed upon a gas company by the fact that the demand of each consumer for gas is not uniform, but varies from hour to hour and from day to day, and those involved by the extra investment in plant required to supply the maximum demand over and above the investment that would provide all the plant called for by the average demand. No labour costs need be taken into consideration, though the intermittent working of a part of the apparatus, which is made necessary by the fluctuations in demand, certainly does involve a slight extra cost for labour. This is so small in proportion to the other items as to be fairly negligible. The maximum demand charge is therefore made up of the following items: Interest and depreciation upon the cost of the portion of the manufacturing plant required to take care of the excess of the maximum make over the average make; extra cost of maintenance involved by the use of this portion of the manufacturing plant; interest and depreciation on the extra cost of the street-mains actually required, on account of the size of the maximum demand, over the cost of the mains that would be needed to take care of the average output; extra cost of maintenance of street-mains involved by their larger size, owing to the maximum demand; interest and depreciation on the extra cost of service-pipe actually required, on account of maximum demand, over the cost of the pipe that would be needed for the average consumption; extra cost of maintenance of the service-pipe involved by its larger size; interest and depreciation on the extra cost of the meter actually required, on account of the maximum demand, over the cost of that which would be sufficient to supply the average demand; and extra cost of maintenance of meters involved by this extra size.

Taking up these items in the order in which they are given, which is not only their order in the sequence of manufacturing and distributing operations, but also, with the exception of the maintenance items, their order in importance, the first to be considered is the interest and depreciation on the cost of the excess plant made necessary by the maximum demand. It would seem that to make an equitable charge on account of this item the conditions must be taken as they actually exist, and not as they would exist if the gas company were supplying each of its consumers singly. Thus all that has to be provided for is the maximum demand resulting as an average of the maximum demand of all the consumers combined; and therefore this item has no relation to the maximum demand of any individual consumer, and must be averaged among them all. To obtain its value accurately, it is, of course, necessary to consider all the conditions of each individual case; but, for the purpose of getting an approximate idea of what it should be, it can be worked out by assuming that the maximum day's make is 1-200th of the annual sales, and that the average sales per consumer will be 25,000 cubic feet per annum. If the average sales per consumer are larger than this, it is practically certain that the maximum day's make will be a smaller proportion of the annual make, and the increase in one direction is set off by the decrease in the other; so that the figures obtained on this basis will be fairly approximate.

The extra plant required by the excess of the maximum demand over the average demand will include the entire holder capacity and 165-365ths, or 45 per cent., of the total manufacturing plant. Assuming average conditions as to the holder capacity provided, and as to the cost of holders and manufacturing apparatus, the excess investment at the works made necessary by the excess of the maximum demand over the average demand will be $25 per consumer. Taking interest and depreciation on this investment at 10 per cent., the annual charge per consumer will be $2·50 per year. By a calculation, the details of which it is not necessary to give, it is found that, under the conditions named, the extra cost of maintenance of the manufacturing apparatus and holders involved by the intermittent use of the former will amount to 30 c. per year per consumer.

So far as the street-mains are concerned, few, if any, gas companies have a maximum rate of output per hour which is larger than 1-1600th of their total yearly sales; and as the average output per hour is 1-8760th of the yearly sales, the maximum demand requires that the street-mains should have a carrying capacity of 8760 ÷ 160 = 5·5 times that which would be required if the demand were perfectly uniform throughout the whole year. In the ordinary street-main system, the average size of main works out a little under 6 inches in diameter, both as to size and cost of laying. If the output were absolutely uniform, it would only be necessary to have a street-main system equal, on an average, to a pipe of 3 inches in diameter, since a 6-inch pipe has a carrying capacity practically 5·5 times that of a 3-inch pipe. The difference in cost between a 6-inch and a 3-inch main would not vary very much from 25 c. per lineal foot in any locality. It is not out of the way to take an average of 100 consumers per mile, or one consumer for every 53 feet of main. The excess investment in street-mains per consumer caused by the maximum demand will therefore be 53c. × 25c. = $13·25; and interest and depreciation on this, at 10 per cent., will amount to $1·33 per year. This is also an average charge resulting from the combined demands of all the consumers, and is therefore to be averaged among them, and not calculated on the maximum demand of the individual consumer. To an extent, the maximum demand of

* This paper was mentioned, in the general notice of the meeting, in the "JOURNAL" for Nov. 8, 1904 (p. 403).

each consumer will influence the size of pipe laid in his immediate vicinity; but this is comparatively such a small matter that it would not seriously affect the amount of the figure derived above.

It is rather difficult to reckon the extra cost of maintenance involved by a street-main system of an average of 6-inch pipe instead of one of an average of 3-inch pipe. Under ordinary conditions, the cost of street-main maintenance depends largely upon circumstances, the effect of which is not increased by increase in the size of the pipe; and in many systems the greater part of the cost of such maintenance is due to breaks in pipes smaller than 4 inches in diameter. On the whole, the cost of maintaining the 3-inch system would probably be fully as great as that of maintaining the 6-inch system; so this item will not influence the total.

In determining the extra cost of the service-pipe involved by the excess of the maximum demand over the average demand, it must be remembered that other considerations besides the quantity of gas to be carried have a great influence upon the size of pipe to be laid in any given case. There is no need to go in detail into these considerations; but the practice in laying service-pipes to street-lamps, which furnishes a case of uniform consumption without any expectation of future increase, may be taken as sufficient proof that under no conditions would a service be laid of pipe smaller than ¾ inch in diameter. Some companies, in fact, do not lay any lamp-post service smaller than 1 inch. The excess investment occasioned by the maximum demand of the consumer may therefore be taken only as being the difference in cost between the size of the service actually required and the minimum size (¾ inch) that would be laid in any case. This extra investment has, of course, to be figured for the individual consumer; but for the purpose of this paper a consumer with a maximum demand of 80 cubic feet per hour will be taken. Such a consumer could be supplied with a 1-inch service. Most gas companies, however, would lay a 1¼-inch service; and the excess investment occasioned by the maximum demand may be taken as the difference in cost between a 1¼-inch and a ¾-inch service. This will be practically the difference in the cost of the pipe and fittings used, since the laying of a ¾-inch service would call for as much labour as the laying of a 1¼-inch service. Taking the low discount of 66 per cent. off list prices, the difference in cost between 1¼-inch and ¾-inch pipe will be 3·75 c. per foot. With an average length of service of 70 feet, the difference in the cost of pipe and fittings would make the larger service cost (say) $2·80 more than the smaller one. If a stopcock were provided at the kerb, 45 c. must be added for the difference in cost between a 1¼-inch and a ¾-inch cock; making the total excess cost of the larger service $3·25. Interest and depreciation on this, at 10 per cent., would be 33 c. per year. The difference in cost of maintenance between one service and the other is practically negligible, as in the case of the mains.

In regard to meters, there must be taken into consideration the question of whether one smaller than the present 3-light meter would be any cheaper than one of that size; and the manufacturers will probably agree that practically nothing could be saved in cost by going below the present size. The extra investment in consumers' meters involved by the maximum demand is therefore only the excess cost actually set over that of a 3-light meter. For a maximum demand of 80 cubic feet per hour, a 5-light meter is ample. This will cost unset $1·40 more than the 3-light; and, with a liberal allowance for the additional cost of connections and setting, the extra investment occasioned by the maximum demand would not be more than $2 for this class of consumer. Taking interest and depreciation at 15 per cent. in this case, on account of the life of the meter being shorter than that of the manufacturing apparatus, mains, and services, the maximum-demand charge on account of meters for the case named would be 30 c. per year. While it is difficult to name exact figures for the extra cost of maintenance involved by the necessity of using a 5-light instead of a 3-light meter, 10 c. per meter per year would seem to be a very liberal allowance.

Summing up the various charges as determined above, we have for the total maximum demand charge per year for a consumer with a demand of 80 cubic feet per hour—

Manufacturing plant, including holders	$2·50
Maintenance of plant	0·30
Street-mains	1·33
Services	0·33
Consumers' meters	0·30
Maintenance of meters	0·10
Total	$4·86

An effort has been made that these figures should err on the high instead of on the low side; and in many cases it will probably be found that $4·75 would be an ample charge for a maximum demand of 80 cubic feet per hour. If this charge varied in exact proportion with the variation in the greatest demand, it would make a charge of about $6 for a maximum of 100 cubic feet per hour. The items of cost to be included in a consumer's charge would be: Complaint expense; gratuitous work; repairs to services; repairs to meters, less the amount of such repairs included in the maximum-demand charge; setting and removing meters; expense of collection; cost of consumers' ledgers; car fare for meter readers; gas bills; expense of reading and indexing meters; salaries of book-keepers on consumers' ledgers, of bill clerks, and of cashiers; interest and depreciation on the cost of a service of the size required to furnish gas at the average rate; and interest and depreciation on the cost of a meter suited to furnish gas at the average rate.

The items made up of the cost of labour and materials will vary with each company, and will have to be determined in each individual case; but it is probably safe to say that they will not exceed, in any well-managed, even though comparatively small, company, $2·50 to $3 per consumer, where, as would be the case with this system of charging, it would only be necessary to set one meter per consumer. The higher figure may be taken for the purpose of this paper.

It was determined, in dealing with the maximum-demand charge, that a ¾-inch service may be taken as the size required to supply the average demand of the ordinary consumer; and the cost of such a service of an average length of 70 feet should not be more than $8. Interest and depreciation at 10 per cent. will give a charge for this item of 80 c. per year. It was also determined that the cost of the meter required for the average demand of the ordinary consumer might be taken as equal to that of a 3-light meter. The interest and depreciation on such a meter may be taken as $1 per year. The total consumer's charge would therefore be—

Expense for labour and material	$3·00
Interest and depreciation on the cost of the service	0·80
,, ,, ,, ,, meter	1·00
Total	$4·80

The charge per 1000 cubic feet of gas used to be made in connection with these maximum-demand and consumers' charges would be such as to cover all the operating expenses not specifically assigned to one or the other of the latter charges and the profit which the company are entitled to make. This charge must be determined separately for each company, and cannot be made the subject of a general discussion. It may be argued that the charges referred to should be made sufficiently high to cover a portion of the profit; but such a course would not conform to the requirement that no greater profit should be made from one consumer than from another when the same service is rendered to each. The maximum demand and consumers' charges make each consumer pay the cost of everything that is furnished to him, except that of the gas he uses. Therefore the unit of service which is common to all cases after these charges have been made, is the delivery of 1000 cubic feet of gas; and all the profit must be included in the cost of this unit, if it is to bear equally upon all consumers.

This system of charging has been applied, as far as the consumers' charge is concerned, in the case of one small gas company; and each of the consumers pays 25 c. per month as a fixed charge, and irrespective of the quantity of gas consumed—the accounts rendered carrying the two items of "Gas consumed" and "Fixed charge." Many consumers use only small quantities of gas, and without this fixed charge they would be a source of loss to the company; but with it they pay their own way. By the action of this charge, the price paid for gas is automatically reduced as the consumption increases; the consumer of less than 1000 cubic feet per year paying at the rate of $5 per 1000 cubic feet, while the one who uses the largest amount of gas obtains it for $1·75. The conditions of manufacture and distribution are such that the equitable maximum-demand charge would be very small; and it was not considered advisable to make it as a separate item. The consumers' charge is probably too small for present conditions. But the services are short, and the district very compact; and as the business is developed, this charge should prove adequate. If it does not, a change can be made at the proper time, accompanied by such a reduction in price that the total charge to consumers of small amounts will remain practically as it is at present, while those who use large quantities will obtain a substantial reduction. After an experience of eighteen months of this method of charging, the managers of the company are entirely satisfied that both the consumers and the company are better off than would be the case were the charge for gas simply a uniform price per 1000 cubic feet.

Believing firmly in the justice, and therefore the policy, of a method of charging for gas that will make each consumer pay his share, and no more than his share, of the expenses and the profit of the company serving him, I hope this paper will aid in doing away with the present method of charging, under which from 20 to 25 per cent. of the consumers are served at an actual loss to the company, an additional 35 to 40 per cent. do not return their fair share of profit, while the rest return an excessive profit.

British Association of Water-Works Engineers.

From a circular issued by the Secretary (Mr. Percy Griffith), we learn that the tenth annual winter meeting has been fixed for Saturday, Dec. 16, at Burlington House. The President (Mr. P. H. Palmer, M.Inst.C.E., of Hastings) will be in the chair. The Council and officers for next year will be elected; and two papers will be read and discussed. The first one is on a subject of far-reaching importance, and should give rise to an animated debate. It is by Mr. Charles H. Priestley, M.Inst.C.E., on the question of "The Municipal Ownership of Water Undertakings." The second is also sure to be an instructive one; the author being Mr. J. J. Lackland, and the title of the contribution "Notes on Pumping, and Description of a Concrete Service Reservoir at the St. Helen's Corporation Water-Works."

AN EXPERIENCE IN THE RECONSTRUCTION OF A GAS-WORKS.

By R. M. Couper, of Brentwood.

[A Paper read before the Southern District Association of Gas Engineers and Managers, Nov. 9.]

Yielding to the blandishments of our worthy President, to whom, in an unguarded moment, the figures dealt with in the accompanying table were shown, the compiler ventures to hope that, in undertaking to give a recital of some recent experiences in reconstruction, he may be affording a little help to those of his professional brethren who are about to embark upon a like enterprise. "The points of interest which always crop up in the erection of new works," urged our President, "would form material enough for a paper at this meeting." Hence this effort, put forth in the spirit of Beatrice when despatched to fetch Benedick: "Against my will, I am sent to bid you come into dinner."

The "Journal of Gas Lighting," April 12, 1904, published a descriptive article upon the work accomplished at Brentwood. Avoiding unnecessary repetition, the following facts and figures may be regarded as supplementary to the account in the "Journal."

Once convinced of the necessity for reconstructing and enlarging their works, the Directors of the Brentwood Gas Company lost no time in laying their proposals before the shareholders. Consent obtained, the tenders upon which the estimated outlay had been chiefly based were accepted, and within four days the contractor for the erection of the retort-house and adjacent buildings was engaged upon his work. The subjoined table, from the letters A to P, sets forth the original estimated outlay; the second column gives the actual amount expended; further down in the second column (Q to X) appears the additional outlay rendered necessary for the full completion of the scheme; and the third column sets forth the percentage of actual as compared with estimated cost.

In Boswell's "Johnson," one finds the immortal Doctor discoursing philosophically for our edification: "I know not anything more pleasant, or more instructive, than to compare experience with expectation, or to register from time to time the difference between idea and reality. It is by this kind of observation that we grow daily less liable to be disappointed." My present purpose, then, is to "register . . . the difference between idea and reality;" and if instruction be derived, the pleasure of conveying the information is much greater than that originally raised by a contemplation of estimates overspent.

The point of interest in connection with A, the gasholder, is that the expenditure exceeded the expectation by a large amount. This was occasioned by the fact that underneath a portion of the site upon which the tank was to be erected made-earth was discovered when levelling operations were in progress for laying down a bed of concrete for the steel tank. Up to the hour when this discovery was made, the ancient inhabitant who can remember everything that happened in the vicinity during his career, had been sought in vain. But now he emerged, leaning upon his staff, and looking preternaturally wise. He "could member when the clay wir dug to make bricks out on." Would that the period of his hibernation had been less prolonged! In the place from whence clay had been dug was found a treacherous spongy mass consisting of poor clay and worse sand intermixed. As nearly as possible, this material occupied the northern half of the site. The southern half was found untouched by the brickmakers; for the Brentwood sewer had been laid in that portion of the yard.

It was decided by the Directors that the whole of the soil—good, bad, and indifferent—should be removed right down to the London clay. This necessitated the diversion of the sewer—an operation of not the most entrancing kind, particularly to tender olfactory nerves. Fear and flavour had to be endured ere the work was done. After the erection of the tank, one heavy thunderstorm proved that something more than sewage was carried by the main drain, for through a defective corner of a man-hole on the edge of our excavations a flood of swirling brown waters poured. An unwonted rainfall, indeed, greatly hampered us in our yard excavations later on, increasing anxiety and outlay, the hilly roads outside being unprovided with surface water drains. Excavations and foundations for the gasholder tank cost £1228, or £938 in excess of the original estimate. The holder is at present a two-lift one of 225,000 cubic feet capacity, but capable of having a third lift added, when the top lift would ride clear of the guide-framing. The total cost of the tank and holder, as it now is, came to £6350 14s. 6d., or £28 4s. 6d. per 1000 cubic feet capacity. When the third lift is added, the cost per 1000 cubic feet should not exceed £21.

The site selected for the extension of the works had earlier been devoted to brickmaking. A chimney, 100 feet in height, was removed to make way for the engine-room, and a whole network of underground flues was followed out and filled up with solid material ere the foundations of the retort-house, coal-store, boiler-house and engine-room could be prepared. More of this work had to be undertaken than appeared at first blush. Extra excavation, too, was made for securing a stable foundation for the 85 feet chimney, as the brick clay near by the site had also been used.

No expense was spared to obtain reliable foundations for the respective buildings. A defective parapet or gable may be rendered strong and sound at small cost; but poor foundations—such, for instance, as were discovered under our old retort-house, the cause of ricketty walls—can only be made good by incurring a serious expense. Contractors need a friendly eye kept upon them, although they may re-echo the sentiment that "no chastening for the present is joyous but grievous." No man more keenly feels the chastening effect of a watchful eye, than the concretor. But for that terrible eye, the cement might be added to the rubble with a pepper-castor. He was an old parliamentary hand at the concrete business who tried to justify shoddy work by declaring, "We must do a little bit for our master when we get the chance." And this was done in "the wee short hours ayont the twal" (when the clerk of the works was asleep) to a pier built to face the force of an Atlantic gale! "There is a limit at which forbearance ceases to be a virtue," said Burke. Forbearance with the concretor, or with the mortar-mill attendant, should be kept at the *minimum*, if the stability of walls be desired.

It had been an original intention to utilize for the purpose of a temporary gable to the new retort-house the sheets and other ironwork of a dismantled holder. These, however, were found untrustworthy. A much stronger and handier gable than at first contemplated was fixed—one that may readily be taken down and as easily re-erected. This, together with the extra cost of foundations, and sundry additions found to be desirable as the work proceeded, brought upon us an extra outlay of £469. [Parenthetically, it may be here remarked that, even on temporary work, an attempt to save money may prove a failure. Since this paper was written, the corresponding temporary gable to the coal store—of brick, not iron—has had to be shored with timber, owing to the pressure of a larger stock of coal than the wall was designed to resist. Ere long this wall can be dispensed with, but the experience is worth placing on record for the lesson it conveys.]

The temptations are many to incur additional expense as new

Table of Costs.

—		Original Estimated Expenditure.	Actual Expenditure.	Increase of Expenditure over Estimate.
		£ s. d.	£ s. d.	Per Cent.
A.	Gasholder and tank and foundations	5,285 0 0	6,350 14 6	20·48
B.	Retort-house, coal-store, engine-room and boiler-house	3,387 10 0	3,856 16 4	13·85
C.	Roofs	903 10 0	1,018 4 4	12·69
D.	Retort-bench, stage-floor, chimney, and boiler-settings	3,631 0 0	3,639 14 7	0·24
E.	Coal discharging, elevating, and conveying plant	736 0 0	918 8 6	24·77
F.	Charging-machine	153 0 0	157 5 0	2·77
G.	Exhausters and engines	196 15 0	299 19 5	52·46
H.	Scrubber-washer	396 0 0	418 12 9	5·71
I.	Turntable and siding	256 10 0	315 7 6	22·95
K.	Boilers and foundations	215 0 0	315 15 11	46·88
L.	Sulphate of ammonia plant	525 0 0	678 19 0	29·32
M.	Station meter and governors	560 10 0	573 10 8	2·32
N.	House for station-meter and governors	185 0 0	302 9 11	63·51
O.	Yard connections and valves, coke-loading bank and yard	230 0 0	1,157 8 4	403·22
P.	Contingencies and engineer's charges [* Engineer's charges only.	1,400 0 0	350 0 0*	..
Q.	Diverting sewer and other drain work	..	116 4 6	..
R.	Fitting up new works with, and connecting old works to, steam and water mains	..	306 19 1	..
S.	Dismantling old gasholder, and converting tank for storing ammoniacal liquor	..	212 4 1	..
T.	Boundary fence, including brick basement wall	..	99 12 7	..
U.	Dismantling old retort-houses	..	100 0 6	..
V.	New well, including pulsometer pump	..	63 5 5	..
X.	New coke-yard office, including furniture	..	65 7 0	..
	Total	18,060 15 0	21,364 9 5	18·29

work proceeds. The contractor is never loth to pile up extras, and is often prolific in suggestion. Then one's own ideas grow; and the desire to have things perfect, which is ever fretting the mind of the engineer, is a daily incentive to increased expenditure. A too great eagerness to keep within certain limits in spending capital may lead, really, to ultimate loss. Once firmly convinced that an addition to the plant or the property will prove a distinct and demonstrable advantage, it is the duty of the engineer to lay the matter before his Directors, and urge its adoption upon them. Fear should not deter him, nor the certainty that he will be told: "This should have been thought of before." "'Tis a fine thing to smart for one's duty; even in the pangs of it there is contentment," said Robert Louis Stevenson, himself an engineer. Extra expenditure can be finally judged only by ultimate results. It was when the ice pressure came closing upon the "Fram" that the teak beams, in which Nansen placed his trust, were demonstrated to be necessary.

Roofs call for no particular remark. Some additions were made to the gutters, and the box ventilator was strengthened.

One point of interest attached to the retort-bench (D) is that in filling up depressions, so as to attain the ground level, advantage was taken of a large quantity of burned clay found upon the site. A lot of it had been used by the builder for making mortar. This material was put down in layers of 6 inches at a time, and flooded with water after being well rammed. It became thoroughly compact, and upon it was laid a bed of concrete 18 inches thick. The regenerative settings are of full depth, and there is a basement carried out to the full width of the building, in which is placed the engine room of the coal-handling plant, the remaining space being available for storing various material. The width in front of the retort-bench on the stage floor will admit of the adoption of stoking machinery—this contingency having been kept in view when the building was designed; the height of the latter, too, allows for an installation of sloping or vertical retorts, should either of those systems be desired. Another point of interest about the retort-bench; a ten-pound note covered the extra outlay upon it. Had this rate of experience compared with expectation been maintained throughout the rest of the operations, "the difference between the idea and reality" spoken of by Dr. Johnson would have been less pronounced. Yet another point worth noting—a special kind of tar-withdrawing valve proved, during a whole winter, a dismal failure. This came hard upon the starting of the new works. A crop of stopped pipes ensued, and many a bad quarter-of-an-hour. But in the spring, when "a livelier iris changes on the burnished dove," a happier state of affairs prevailed, by the adoption of simple weir-valves to supplement the more tortuous ones. The change was instantaneous and exhilarating.

Under the letter E—coal-discharging and elevating—an increase of outlay became necessary, inasmuch as a brick and cement hopper, originally intended for the reception of coal from waggons, proved inadmissible, and had to be abandoned in favour of a steel hopper of different form and greater capacity. The steel hopper is capable of receiving some 14 to 15 tons of coal at a time; and the thought of the new enlarged waggons partly determined the change. Rails, also, were prolonged over the hopper, to admit of discharging waggons by shovelling through side doors when the hydraulic ram is not available. This alteration, and some difficulties in sinking to the necessary depth for the boot of the elevator, explains the increased cost of £182.

Exhausters (G) cost about £100 more than the original estimate, because, between the time when the tenders were obtained and the time when the plant was being fixed, it was found that the old combined engine and exhauster designed for summer use were not equal to our needs. Consequently, the best exhauster on the old works, being comparatively new, was coupled up to a new engine (horizontal), all on one bed-plate, to correspond in appearance to the new exhauster of 30,000 cubic feet per hour.

As with the exhausters, so with the boilers (K), about £100 extra expense was incurred. Heavy foundation work, and a determination to sectionize the steam supply to the various points on the works, involved the additional outlay. At the time of planning the extensions, economy seemed to dictate that one large new boiler and the best of the old boilers would serve for years to come; but—and here we have another point of interest—ere long it became apparent that an installation of two large boilers (22 feet by 5 ft. 6 in.) would have been infinitely wiser. *Experto crede!* "She is not man enough," said one of the stokers, pointing to the smaller boiler; and, paradoxical utterance though it be, the truth is there. Thus an arrangement which in 1902 seemed feasible, proved, by 1904, a defect.

The scrubber-washer (H) is a new feature on the Brentwood works, but it bids fair to earn its daily steam. Prior to its adoption, the ammonia went on to the purifiers. Now, however, it is recovered and goes on to the sulphate plant (L), which cost, it will be noted, £150 in excess of the estimate. An extra large lead-lined tank for receiving sulphuric acid from railway tank-waggons, instead of importing by carboys; an increase in size of settling and cooling tanks; drainage difficulties; and the substitution of a new overhead cast-iron liquor supply tank for an old wrought-iron one (thought, at one time, to be "good enough"), explain the added cost. It may be of interest to state that the square base of a dismantled chimney has made a substantial pedestal for the cast-iron liquor-tank. The original retort-house and coal-store of fifty-three years ago now make an excellent airy sulphate house. Another discarded retort-house and coal-store occupy a site which will well serve for enlarged purifiers in the not distant future. An old gasholder tank now proves an ample liquor store. In a variety of ways, indeed, old plant has been utilized anew.

The contemplated cost of the house for the station meter and governors (N) was exceeded by £117—partly through the necessity for laying down extra deep and wide foundations, owing to the proximity of the site to the aforesaid artificial soil near the gasholder, and partly by increasing the height of walls.

Appropriately enough, it is under the letter O that yard connections are placed. The interjection is significant when you "compare experience" (*à la* Dr. Johnson) at a cost of £1157 "with expectation" at the modest figure of £230. The latter amount had been set down by a sanguine mind, fortified by the thought that a reserve fund would exist under the elastic term "contingencies." Without a plan of the old connections, and no idea of either their patchwork formation or their intricacies, one was left to mere conjecture. "Hope springs eternal in the human breast;" but hope did not foot the bill that piled up ere all necessary alterations to the old yard connections, and linking them up to the new, were effected. Due care was taken not to copy the patchwork example unearthed.

The capital expenditure to Dec. 31, 1901 (ere the new work was begun) amounted to £27,775, equal to £573 per million cubic feet sold. To Dec. 31, 1904 (after the work was completed) it amounted to £45,000, equal to £743 per million feet sold.

A point of interest in regard to naphthalene may be mentioned in a few words. On the old works considerable difficulty was experienced with this "regrettable" trouble. The condenser got obstructed, also the inlets of gasholders. The condenser came mid-way between the retorts and exhausters. On the reconstructed works, we experience no trouble, and in the district the nuisance diminishes. The condenser is now placed at some distance after the exhausters. Before the exhausters are reached, the gas is made to travel along 180 feet of 15-inch steel main, carried on the top of the bench and on the wall of the retort-house. This main has a fall back to the hydraulic main. The foul main from the exhausters to the condenser also has a fall in the opposite direction to the flow of the gas.

In the design of the new buildings, a thought was given to the residential character of the neighbourhood. But a pleasing effect upon the eye need not be ignored even where gas-works are erected in a tame locality, devoid of architectural grace. We may as an industry, without indulging in anything savouring of extravagance, set a good example in the erection of substantial buildings, profitable to the shareholder, while not inimical to that desire for the beautiful, which, happily, is on the increase in our time. Thus, while fulfilling the duties of our profession in the most practical manner, we may prove ourselves men of "light and leading" in a sense agreeable to the cult of John Ruskin.

Discussion.

The PRESIDENT (Mr. S. Carpenter, of Dorking) said the paper did not lend itself to much discussion; but Mr. Couper had given them some useful particulars and some useful hints, and possibly members might like to make a few remarks.

Mr. G. R. LOVE (Guildford) said he had listened with a great deal of interest to this able paper. Having visited the old works at Brentwood, he had no doubt Mr. Couper fully appreciated his new ones. In the old works, the retorts were erected on three sides of the retort-house; and the men had to work in the centre. Certainly the advantage of the new plant to Mr. Couper would be very great, as well as to his men. He had had a number of difficulties to overcome; and he thought they had been overcome in a masterly way. He (Mr. Love), however, considered that before Mr. Couper put down his gasholder tank, he should have made some trial bores, and saved the extra expense. However, he was not the first man who, to his cost, had not done this. In putting down new plant, the safest plan was to make bores over the site. He did not know, however, that in this case it would have made much difference in the cost; but Mr. Couper would have known beforehand what the cost was likely to be. As retorts had been adopted similar to what he himself had at Guildford, naturally he thought that Mr. Couper had acted wisely. (Laughter.) He also considered he had acted prudently in leaving plenty of room for future extensions. One never knew what was coming in the near future; so that it was well to leave plenty of margin for extensions. As to the use of machinery for coal elevating and conveying, of course that was always a question for every individual to settle for himself. He (Mr. Love), however, could not help thinking that the expense was rather great for the economy that was to be produced. This was his opinion. Otherwise he thought the works Mr. Couper had designed were of very high class, and reflected great credit on him and his engineering capacity.

The PRESIDENT said he should like to point out one thing. Mr. Love had spoken of extras. If the members would look at the table, extras were principally in connections. With regard to the point raised by Mr. Love, Mr. Couper suffered from the difficulty of having no plan; and it was not possible to see through 3 feet of solid clay. However, the average amount of extras was 18·29 per cent. Taking off the considerable item in connection with foundations and mains, the amount was not heavy.

Mr. COUPER, in reply, said that two bores had been put down quite close to the very point where they discovered this mass of clay and sand. These bores had been made by the gentleman

who previously owned the land. He (Mr. Couper) inquired of the labourers who carried out the work as to the result; and they told him they went through clay all the way. Therefore he did not suspect that anything of the nature of the mass of clay and sand was there; otherwise he would certainly have made bores. With regard to the coal-handling plant, they were placed in such circumstances that they could not unload coal alongside of their coal-store; and they had therefore to adopt coal-handling plant straight away, if they were to have a retort-house and coal-store in the position they now occupied. It was recognized that there were many serious difficulties to be met. He had to face those difficulties, and to make up his mind once and for all as to whether he should go in for coal-handling plant immediately or later on. He thought that it was better to face it at once. But he had to keep down the expenditure as much as possible. Then these difficulties arose after they had commenced, and had to be met. The work had to be completed; and he was anxious the works should be started as fully equipped as possible for the duties they had to perform. The extra cost ultimately came out at 18·29 per cent. His Directors were fully satisfied, when the works were completed, that the extras were not exorbitant.

THE FUNCTION OF A GAS ASSOCIATION.

At the Annual Meeting of the Michigan Gas Association, held in Detroit from the 20th to the 22nd ult., Mr. E. F. Lloyd, the President, devoted to the above subject the bulk of his Inaugural Address. He explained, at the outset, that he had prepared it in the form of a paper, so that it might be open for discussion by the members. We give it practically in full.

The year that has passed, though not marked by any unusual advance in production, has, nevertheless, been one of developing progress. Encouraging signs of the healthy activity and alertness of our business are to be found in the increasing employment of technically educated men in the manufacturing and engineering departments, and the application of sound and energetic business methods in its commercial branches. This commercial development has made such rapid strides in the last few years, that it may be looked upon as having been revolutionized. Better appointed offices, greater attention to the legitimate wants of consumers, and an effort to anticipate these wants and to create a demand for gas, are manifested now by every company of any pretensions whatever. At the same time there has been a wholesome tendency to distinguish between the different characters of service, to analyze the relative profitableness of consumers, and to thereby make such rates as will increase both the service of the public and the net income of the company.

These questions will be found to have had considerable thought devoted to them by those who have prepared subjects for your consideration at this meeting. I will not, therefore, occupy your time with a review of matters which will be much better presented to you by the writers of the papers to be read, but rather solicit your attention to some of those features which are apt to escape our notice in the pressing routine of our daily work. These will crystallize around the future of our Association.

Perhaps first to be considered should be the effort which has been made to organize a National Association and its present status. The apathy with which this has been received, or the objections which have been directed against it, may be taken as evidence that the gas interests of the country do not believe that there is a suitable field for such an organization, or that they fail to perceive their best interests. I incline to the first view. Theoretically, the idea of one central body, with branches or chapters in the various parts of the country, having at its command large funds for the prosecution of research, for the general protection of its interests, and for the compilation of information, is unquestionably an attractive proposition, and one which originally enlisted my own support. Yet, in the light of more mature consideration, it is extremely doubtful whether such an organization could accomplish more than a little of what it would set out to do. The reasons for this seem to me to group themselves under two general heads—first, that the scheme of organization does not offer methods intrinsically different from those which now obtain, and with regard to which there is a fairly well-defined, but uncrystallized, opinion that they are insufficient; and, secondly, that the magnitude of the undertaking and the distances involved, coupled with the extreme diversity of the interests to be served and the laws under which they operate, would make the organization too unwieldy and too remote and impersonal to be effective for the individual member.

Let me attempt to define the general features of the problems before us. From the technical aspect, the installation and equipment of a gas plant is a matter of mechanical engineering. The subsequent operation involves chemical engineering in the production and ordinary trade methods in the sale of the product. Our educational institutions, therefore, at present have largely in their *curricula* the entire range of subjects which should be understood by the well-equipped gas engineer; though unquestionably a consolidation of these into a more concrete course, with specific facilities for research, would direct more attention to this branch of engineering. That these institutions have not given us greater attention lies more with us than with them. A demand would be, as in all other lines, very quickly supplied; and under the State University work supported by the Gas Companies of this State, directed by this Association, it is developing rapidly.

From the commercial aspect, the public should be educated through a broad and comprehensive policy of publicity, through the Press and otherwise, to a greater knowledge of, and familiarity with, our business in its various branches, and to viewing in correct perspective the many economic fallacies which assail us and other *quasi*-public institutions. There is equally the valuable field of the current collection and compilation of the law of *quasi*-public corporations as it is made, interpreted, and moulded in the various legislative enactments and the daily decisions of the Courts. Yet consideration will, I think, show that these functions should not be undertaken as a personal affair only of the associated officers and employees of the interests affected.

It is a point which must not be overlooked in any discussion of this matter, that in the last few years the character of the representation has undergone a radical change; so much so that all our Associations, even on their present footing, are now in a transition stage, the future of which is not yet clear. When most of them were founded, and for many years afterwards, the members represented independent companies. To-day, all those of importance, save a few, are under syndicate control, with many of our brightest men in their employ. These syndicates hold their own private meetings, where entire freedom of speech prevails, and every detail of the business of each company is open to comparison with all the others, and to the intimate criticism of all the participants. To my mind, the ultimate effect of this condition will be the concentration of the work of the large associations upon those subjects of common open interest among the officers of these syndicates and of the few large independent enterprises, and the very great development of strictly local or State organizations.

This brings me at once to the consideration of the possibilities, scope, and value of our own Association. Primarily, I believe that the Michigan Gas Association should be reserved wholly for Michigan interests. This is not dictated by any feeling of exclusiveness, but rather by the idea that it would perform the functions which I will endeavour to outline. It would lose weight and influence by reason of the affiliation of any outside interests. We would always welcome fellow gas men; and we would be glad to give our little knowledge and receive their large store. We would not tax them, and they would not vote. Members removing to activities beyond the State would thereby pass into an Honorary Service Class, without dues or vote. I would maintain the existing classes of membership, adding thereto that of the Gas Companies of Michigan. Under such an organization, it would be strictly a Michigan Gas Association, composed of Michigan gas men. The necessary revenues for its purposes should be derived from individual dues as at present, and from the companies represented. Each company should have a voting representation, and dues placed upon its output—limited, however, so that the total expense to, and voting strength of, any one company should not exceed that of an average company. The management would be in the hands of officers and an Executive Committee. Its function would be the discussion of all matters pertaining to the business, as at present; but beyond that, its funds, on authority from the Executive Committee, should be usable for the purpose of supporting such educational features, both technical and of a public character, as might be found desirable, for preserving the interests of the Association in matters of both municipal and State legislation, for defending a member from unjust attack from any source, for investigating charges of inefficient service by any company member, for recommending corrective measures where needed, and for such other purposes as might be deemed advantageous to the general good. The Detroit City Gas Company were recently put to the individual expense of maintaining in Court a principle of vital importance to every company in the State.

Properly conducted, the public confidence in such an Association would gradually and naturally grow to be an asset of incalculable value. The scheme of organization proposed is not theoretical, nor may I claim for it originality; it having been very fully developed from a most modest beginning, and being now in successful operation, among the employing interests of the city of Detroit. The scope and method differ, but the principle is essentially identical. Some such form of organization must, in my opinion, eventually be evolved. From my experience in other directions, I can see no serious obstacle; neither can I see that it should in any manner interfere with our present usefulness, but rather that this would be carried on to greater advantage than at present, and the scope of our activities for the good of the industry and the public be immensely broadened.

There are many questions which we shall in the future be called upon to face and settle, due to the unrestrained conduct of our business in the past. *Quasi*-public service is not a private affair of the owners only of such corporations. Yet it has been so looked upon in this S ate in the past; and, unless wisely handled, the consequences will be present to plague our future for many years. The gas business is, by its nature, an economic monopoly, in that the community can be best served from a single supply. It is of no consequence to the discussion that the municipal corporation does not here grant an exclusive franchise. The nature of the business makes it one. A franchise essentially

should be a permit to the corporation from the municipality for the use of the public highways. In return for this licence, the company should guarantee immunity from any responsibility attaching to the municipality by reason of such use; and the mutuality of the agreement should be evidenced by an undertaking upon the part of the company to supply their product to the inhabitants of the town at a price yielding a reasonable dividend upon the capital required.

Theoretically, these conditions are supposed to be embodied in all franchises; but the treatment of the company as a piece of private property rather than as a *quasi*-public body, has led to failure to restrict the owners in its capitalization and to great secretiveness as to details. To these more than to any other causes—perhaps more than to all other causes combined—has risen the fallacious propaganda of municipal ownership, the undue taxation imposed, and the continual attack to which the business is subject. In the early days of our activity, when gas was used primarily as an illuminant, the bonds and stock of a company generally represented either money that had been originally invested, or earnings that had been applied to the development of the property. This condition continued until the advent of the idea of using gas for other than illuminating purposes. The immense increase in output and inflated earnings possible with such increased use, have been seized upon by many of those who have seen and appreciated the possibilities, with the result that reorganizations have been undertaken, capitalized on a basis of the future earning possibilities, and usually far in excess of what was immediately in view. It is true that at first such stocks and even bonds had a market value of only a fraction of their par value. Nevertheless, this capitalization existing, as the earnings increased and dividends were paid, it became gradually assumed that the property would continue to earn such returns; and the securities naturally inflated in sympathy with this feeling. The injustice to the public is, perhaps, no greater from this source than from many others due to the laxity of our corporate laws; but it is unquestionably responsible for the evils I have mentioned. Beyond question, much can be said to show that the reorganizations and over-capitalizations were justifiable in the sense that they did not give undue reward to those who had the sagacity, and were thereby attracted, to employ it in serving the public more efficiently than had ever been done before.

If, then, we have at hand the means of counteracting, by concerted effort, the heresies which find their way into the Press through uninformed writers and without contradiction, it would place the public service corporations in a more correct perspective in the public eye. Sooner or later, the State will undertake some measure of regulation; and it will be well for those in control at such time if they are in a position to aid in and check vicious legislation. The public are not unreasonable if they are reasonably treated, if their way is made easy, and if they are properly and fully informed. As corporations, we are legal individuals; and, in the larger as well as in a selfish sense, we are each other's keeper. A lax, an indifferent, or a bad management extends a malign influence over all its neighbours. A knowledge on the part of the public that an enterprise so conducted tails to meet the approval of the business within the State as a whole, would inspire confidence of the most far-reaching and inestimable value.

The function of our organization should be in the nature of a self-inquisition. No company should be admitted to it, or permitted to remain in it, unless its methods met with the approval of the majority of the members. Support should be refused to any company wilfully misusing their privileges; and the mere fact of the carrying out of a high principle of action would inevitably and speedily instil into the public mind the same feeling of confidence in the Association which has stood the employers of Detroit in such good stead, and be worth many times over more than the possible cost and trouble of such an organization.

That our existing organizations do not meet our present necessities is obvious to the most casual observer. It is a quality of the human mind that it clings to an established form long after the substance has disappeared. The inertia of the mind, sometimes miscalled "conservatism," is—next to selfishness—the greatest stumbling-block in our ethical development. Because a practice or a form was highly beneficial to our fathers, this is no manner of reason that it is suitable to us. Nations are formed and rise from obscurity to greatness through the pursuit of an idea unhampered by tradition. As ideas are accumulated, the nations stagnate and then wane. Society's organizations pursue the same course.

On all sides in America we hear complaint of our Gas Associations—that they are run by cliques, that the man who serves them has an axe to grind, and that their proceedings are tame or uninteresting. In all this there is some, and in certain cases much, truth. Why not recognize that the conditions which brought them into being are modified or are past—that the forms are inoperative for the present and dead for the future? My stand is that our organization is not to-day able or competent to successfully meet the conditions which confront our business in this State; that our problems are up to us—right here—and not to somebody in New York or in California; and that we cannot meet them as individuals, as associated individuals, or as isolated companies. When the problems were only technical, the technical members got together for the advantages of joint work; later on the sales agents—the business end—were added. Now, when the very existence of the companies themselves is threatened through the various forms of Socialistic progaganda, it is time that the companies should organize for combined resistance to the assault.

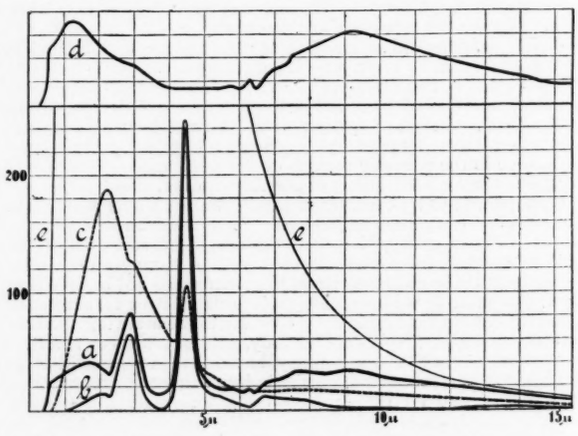
I appreciate that the Association neither could nor should entertain so radical a change without exhaustive discussion and self-education. I therefore recommend that a Committee be appointed to investigate the subject of "broadening the scope of our Association, by creating a company membership," with instructions to submit a printed report for distribution among the members at least two months before the next annual meeting. There are many other matters of general interest which might well claim our attention. But those which are most vital affect us as associated companies rather than as associated officers; and I would therefore postpone them until we know if we may meet them together or must meet them singly.

INCANDESCENT MANTLE RADIATION.

The nature of the radiation emitted by the incandescent Welsbach mantle has lately been studied by Professor H. Rubens, of Charlottenburg, and was reported on in a paper which he read before the 77th meeting of German Natural Philosophers and Physicians, held at Meran on the 27th to 30th of September. The paper was entitled "Emission Spectrum of the Welsbach Mantle," and the following epitome of its contents has been made from the pages of the "Zeitschrift für Beleuchtungswesen," in which it appears in full.

The author has previously called attention to the high proportion, relatively to its total emission, of heat rays of great wave length in the Welsbach light. Messrs. Nernst and Bose, on the other hand, have come to the conclusion that a high proportion of the total radiation lies in the visible field. Hence it seemed important to make a spectro-thermometric investigation of the spectrum, and to establish the relation of the emissive power to the wave length. The energy measurements were carried out with a mirror spectrometer and a linear thermopile. A prism of fluorite was employed for wave lengths up to $\lambda = 8\ \mu$, and one of sylvine up to 18μ. The curves were then reduced to the normal grating spectrum.

The investigation was made on: (1) An ordinary Welsbach burner, without chimney, with a "Degea" mantle, containing 99·5 per cent. of thorium oxide and 0·5 per cent. of cerium oxide; (2) the same burner without a mantle; and (3) the same burner with a mantle rendered non-illuminating by coating it with iron oxide by dipping it in ink and raising it to incandescence. The



results of the three sets of observations are shown diagrammatically by the curves, *a*, *b*, and *c* respectively, in the annexed figure. It appears therefrom that the energy curve of the Welsbach light (*a*) is very similar to that of the simple bunsen flame (*b*) between 2 μ and 5 μ, but deviates from it in the much longer and much shorter wave lengths; the visible field of the spectrum belonging to the latter—viz., from 0·4 μ to 0·8 μ. It must be concluded from the correspondence of the two curves in the part of the spectrum in which lie the strongest emission bands of the bunsen flame that, firstly, the mantle has an extremely small emissive power at that part, and, secondly, the mantle is nearly wholly transparent to these rays. The difference between the two curves must represent approximately the distribution of energy in the mantle spectrum; and this is shown graphically in the curve *d*, for which the ordinates have been taken on double the scale of those for *a*, *b*, and *c*.

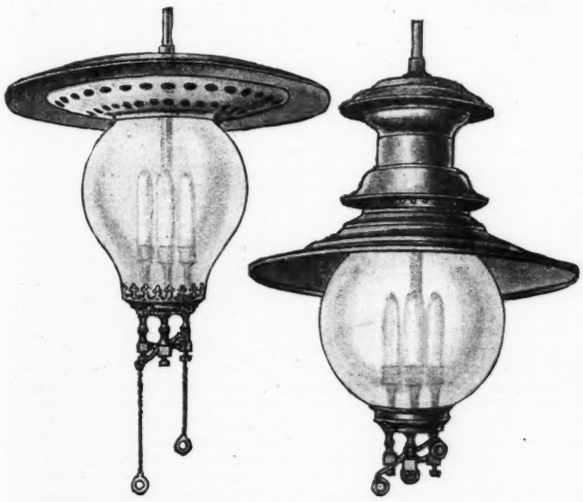
The iron oxide mantle is only red hot in the outer zone of the flame, and its temperature, according to the optical pyrometer, is from 1050° to 1100° C. Its total emission is about double that of the Welsbach mantle, and its emissive power is particularly in excess between 2 μ and 5 μ. Its permeability by flame radiation is very low. The temperature of the Welsbach mantle at the same spot was from 1500° to 1600° C.—or (say) 1527° C.—which corresponds with 1800° from the absolute zero. If the energy curve of an absolutely black body at this temperature is plotted

out according to Planck's formula, the abscissae on the same scale as for d, and the ordinates so that the areas are in the same ratio as the total radiation of the black body is to that of the mantle, the emissive power of the mantle may be ascertained from the ratio of the two ordinates at any part of the spectrum. Account must, of course, be taken of the openwork character of the mantle.

The researches showed that a perfectly black body at 1800° (absolute), and of the same structure as the mantle, would have a total radiation 32 times as great as the latter. Curve e represents the energy emission of the black body. The ratio of the ordinates at any particular wave-length represents the emissive power of the mantle. At 0·45 μ, the value is 0·86; at 0·70 μ, it is 0·062; at 2·0 μ, 0·0073; at 4·0 μ, 0·0079; at 6·0 μ, 0·0270; at 9·0 μ, 0·395; and at 18·0 μ, 0·81. Thus in the blue (0·45 to 0·50 μ) portion of the spectrum the emissive power of the mantle is very high; but it diminishes rapidly to the red (0·70 μ). It only begins to increase again at the very long wave lengths, where the radiation forms but quite a small fraction of the total radiation. This explains the favourable action of the Welsbach mantle as a source of radiation with long wave lengths. It not only emits these rays in larger quantity, but it has the further advantage that the short waved heat rays which are present in a preponderating measure in other sources, are almost wholly absent. The emissive power at different wave lengths acquires decided importance in regard to the light emitted by the Welsbach mantle. The measurements confirm the theory of Nernst and Bose that the mantle, apart from its finely-divided material, primarily derives its high temperature from its low total emissivity. This high temperature of 1500° to 1600° C., in conjunction with the large radiating surface, and the high emissive power in the visible field of the spectrum, is responsible for the well-known high illuminating effect.

LAMP IMPROVEMENTS.

Messrs. Pond and Co. continue to make a study of their lamps with the object of applying to them as many conveniences as possible to maintain their efficiency and for protective purposes. Three fresh comely looking lamps, certain of the features of which are identical, are additions to the firm's productions which are worthy of special mention. In the first place, there is the "Dwarf Wis," which is certainly a unique lamp, and will be found especially useful where there are low-pitched ceilings, and yet a high illuminating power is required. The lamp is only 1 ft. 4 in. over all; and its most pronounced feature which adapts it for low rooms is its double reflector. The lower reflector is perforated; and the concave sides of the two coming together form a collecting chamber, which supplies a good protection to the ceiling immediately above. These lamps are made



THE "DWARF WIS." THE OUTDOOR "PILOT."

for two, three, and four light clusters. The gas-tap is outside the bottom plate of the lamp, where it keeps cool; the gas regulating-screws are also outside; and what is found a very useful addition in large lamps is the screw syphon provided at the lowest point for the easy removal of any condensation or stoppage in the gas-cock. In this lamp, as in others of their own make, Messrs. Pond and Co. will have nothing to do with either screws or clips for the support of the large globes in a rigid manner, or anything else that causes the globe to jamb against any immovable surface. They are of opinion that such means of holding globes in position in high-power lamps are all too frequently the cause of destruction, through insufficient play for expansion and contraction. Thus in this "Dwarf Wis" lamp, the firm have adopted a patent bayonet-catch globe-holder, which is found very effective. The two other lamps are the indoor and outdoor "Pilot," and both are of high illuminating power. They, like the lamp already described, are fitted with the bayonet-catch arrangement for holding the globes, and the outside gas cock, regulating screws, syphons, and bye-pass, with the number of burners according to requirement. In the case of the indoor form, the globe is comparatively small, with a large reflector above with central opening. Both globe and reflector are supplied with an ornamental corona. Near the top of the supply-pipe is also a concave reflector, which also acts as a ceiling-protector. This is a strikingly neat lamp. The outdoor "Pilot" is a lamp much the same in appearance as other so-called gas "arc" lamps, with metal hoods and chimneys; but, as previously mentioned, it embodies all the commendable features described above. The large globe in this case is not only carried by the bayonet-catch support at the bottom, but it makes joint with a movable ring working up and down on the bottom part of the metal chimney. This is a very ingenious arrangement; and, while it affords full play to the globe in the matter of expansion and contraction, it allows of variation in the depth of the globe. A suspending hook is supplied for carrying the globe, when the interior of the lamp requires attention. In these lamps, Bray incandescent burners are used; and this statement is a sufficient indication of a high efficiency for the consumption of gas. The outdoor "Pilot" is of strong build; and what is also of importance it is (like the other lamps referred to) reasonable in price. In use, it cannot fail to give satisfaction.

A LARGE ELEVATED WATER-TANK.

It was recently pointed out in "Engineering" that large water-tanks carried on high steel towers are not much in vogue in this country—at any rate, not nearly to the same extent as in the United States, where a special study appears to have been made of the art of designing and building such structures. The modest dimensions of the earlier tanks have been increased, and there is now one which will contain a million gallons of water, standing on a tower 135 feet above the ground level. Both tank and tower were constructed by the Riter-Conley Manufacturing Company, of Pittsburg, whose Structural Engineer (Mr. F. W. Bowman) recently gave an account of it to the members of the New England Water-Works Association. The tank is of steel, and is 70 feet in height and 50 feet in diameter. The tower supporting it is also of steel, and is formed of twelve columns braced together. Four are placed 17 ft. 8 in. apart, in the form of a square, under the central part of the tank, and carry most of the load; the weight borne by each of the columns being about 700 tons. The remaining eight columns are ranged round the circumference of the tank in line with the four central columns. The foundations for all the columns are carried down to solid rock, and are formed of concrete blocks with granite cap-stones. The stones for the four central columns are each 6 ft. 6 in. square and 3 feet thick, and each weighs 11 tons. The columns stand on cast-iron bases, which are 5 feet square at the bottom and 2 ft. 7 in. square at the top. The platform carrying the tank is constructed of 12-in. I-beams, which are carried on box-girders spaced about 9 feet apart from centre to centre. These in their turn are supported on pin-connected girders, which transmit the load to the columns. The spaces between the I-beams which form the actual platform are filled with concrete, which rises 4 inches above the top of the beams. The steel plates forming the bottom of the tank are $\frac{1}{2}$ inch thick, and the side plates have a thickness varying from 15-16ths inch for the bottom ring to $\frac{3}{8}$ inch for the top ring. Between the roof and the shell a space of 30 inches is allowed for ventilation, and the space is fitted with a heavy wire screen. The roof is of $\frac{1}{4}$-inch plates, supported on steel trusses. The pressure per square inch on the granite caps below the columns does not exceed 400 lbs., and that on the concrete 250 lbs. The tower was calculated to withstand a wind pressure of 50 lbs. per square foot of the exposed surface; and the pressure on the tank was assumed at two-thirds of this amount on the diametrical area. The cost of the tank and tower was a little over $100,000.

Among the elections for Mayors which recently took place, we notice that Alderman Edwin Finn, the Chairman of the Lydd Gas Company, was chosen for the eighteenth year; and that Mr. G. F. Thompson, one of the Directors of the Dudley Gas Company, was retained in his position of Chief Magistrate of the town. Mr. C. Tacon, the Chairman of the Eye Gas Company, who last year was re-elected Mayor of the town for the tenth time, has given place to Sir T. H. Tacon. Mr. Hartley Emmott, the new Mayor of Burnley, has been Chairman of the Gas Committee since 1897. The new Mayor of Guildford (Mr. F. F. Smallpeice) is Chairman of the Gas Company; and Alderman Hastings Fowler, who has been elected Mayor of Scarborough, is a Director of the Gas Company, of which his father is Chairman. In the "JOURNAL" for the 17th ult., it was mentioned that Alderman T. E. Lowe, the Chairman of the Gas and Electric Light Committee of the Burton-on-Trent Corporation, had been chosen to fill the position of Mayor. We are pleased to find that he was duly elected.

REGISTER OF PATENTS.

Automatically Operating the Valves of Gas-Lamps.—Kuechler, F., and Hubrich, W. R., of Stettin, Germany. No. 19,260; Sept. 8, 1904.

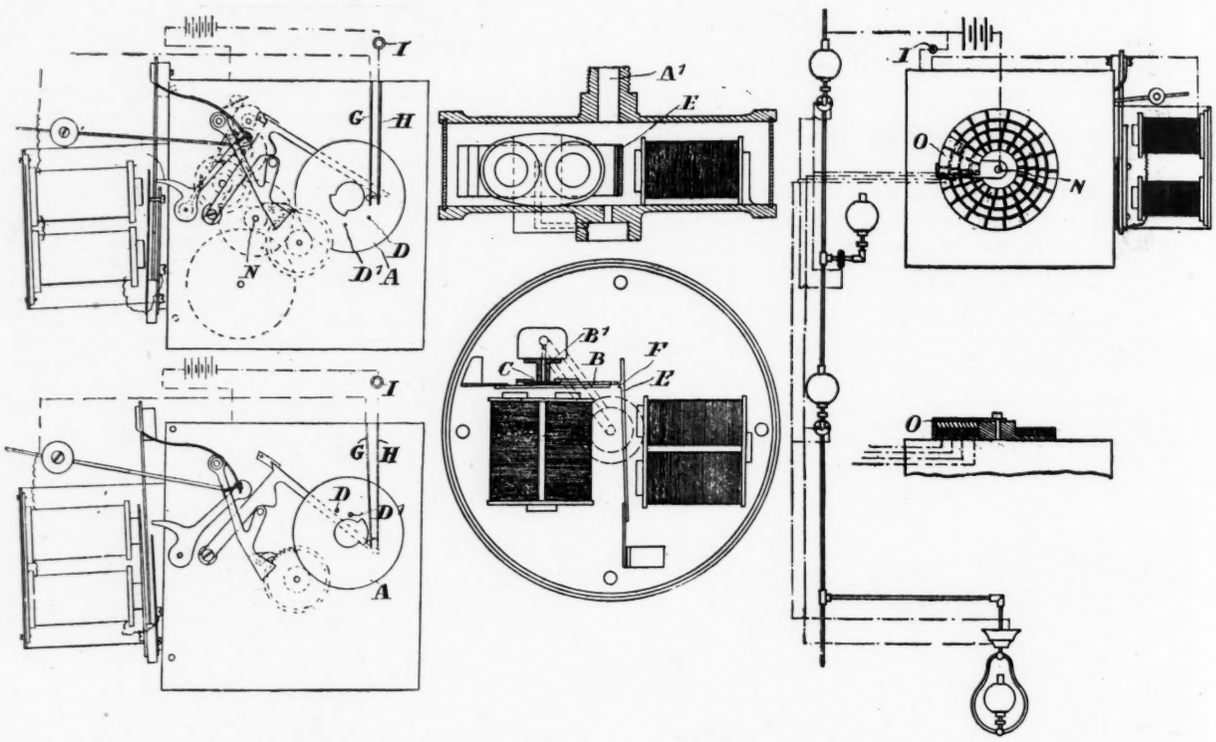
By means of this invention, the valves of a number of lamps can be automatically operated at a certain hour to supply light, and at a predetermined hour turned off again; and thereafter the mechanism can be automatically brought into such a condition that, by pressing a button, the lamps are lit for a short time, should illumination be required during the night.

The present invention is illustrated in the accompanying drawings, in which two views are given of the gas-valve operating apparatus (by means of which the lamps can be lit and extinguished automatically by electricity) in different positions. In the centre is the magnet device at the lamp; the device being enclosed in an air-tight casing, the lid being removed. The general arrangement of the apparatus (the commutator switch being shown in side elevation) is also given; and, as detail, a cross section of the switch.

The automatic turning on and off of the gas for an evening's illumination is affected by a twenty-four hour wheel A provided in a clockwork mechanism. The wheel carries two pins D and D^1, one or both of which may be adjustable to any hour. The pin D set—for example, at six o'clock in the evening or the other D^1 fixed at (say) the hour of ten o'clock in the evening—raises the angle-lever C to a certain height at this hour, after which the lever falls back into its original position; for it is clear that as C is raised it will be moved to the left at the same time and disengage itself from the pin. Thus the mechanism shown in the drawing is set in operation for a few seconds. The circuits are now closed for a short time, inasmuch as, by the rotation of the shaft N, the contact spring arm O passes quickly and successively over segments arranged about the shaft N. The circuits thus closed, if the pin D operates, energize the magnets of the corresponding lamp groups, and the magnets operate the valves so as to allow of the flow of gas to the lamps—the latter being ignited by small ignition flames. If the second pin D^1 is pressed at ten o'clock in the evening on to the lever C, closing of the circuit is effected by the spring O again touching the segments, and so effecting the closing of the valves in the corresponding lamp groups.

The cam E of the wheel F is fitted on the twenty-hour wheel A in such a manner that the cam at the moment at which the illumination for the evening ceases, presses the spring G (which is insulated on the side near the cam) against the spring H. Illumination during the night may now be effected by pressing the button I. In this way, a circuit is closed and the armature is attracted by the electro-magnet. The spring connection then presses down the lever; the clockwork being thus set in operation as described. The switch spring O, secured on the rotating shaft N, slides, as mentioned, successively over the contact pieces on the copper rings; the corresponding lamp groups being thus lit up.

If the second pin D^1 operates, or the button I be again pressed, the contact spring glides in this instance quickly in succession over the contacts, and operates the closing magnets—the corresponding lamps being thus extinguished in groups. In this manner, circuit closures taking place one after the other in quick succession are effected, and any desired number of lamps can be ignited and extinguished one after the other in groups.



The arrangement of the opening and closing devices is as follows: The air-tight casing is constantly filled with gas, which enters through the passage at A^1. When the opening magnet is operated, the armature B, which keeps the passage B^1 normally closed by means of the packing C secured on the armature, is attracted, and the gas reaches the lamp without obstruction. It is ignited by the small well-known ignition flame, which is constantly fed through a small pipe or bye-pass. As before mentioned, the circuits are closed only for a short period; and it is therefore necessary that the armature B should be held in its open position. This is automatically effected by the armature E provided with a nose F; the latter taking over the armature B and preventing a flying-back of the latter into its position of rest. If the closing magnet is operated, the nose F releases the armature B and the latter presses the packing plate C provided on it on to the valve-port, and thus prevents the flow of gas, which causes the extinction of the lamp.

The current passes from the battery to earth (say, the gas-pipe) in one direction, and in the other through the arm O and contacts to the opening magnets of the two lower lamps, and contacts to the opening magnets of the two upper lamps. It also travels through the contacts to the closing magnets of the two lower lamps, and to the closing magnets of the two upper lamps—the magnet windings being also earthed to complete the circuit. The closing contacts are in arrear of the opening contacts, so that the closing magnet will still be energized after the opening magnet is de-energized. When the casing is empty and the two magnets are energized and de-energized, the armature E has time to spring back to engage the armature B; but when the casing is filled with gas under pressure and the two magnets are energized and then de-energized, the armature E moves slower, and is late to engage the armature B.

Continuous Distillation of Tar.—Ray, E., of Turin, Italy. No. 23,983; Nov. 5, 1904.

It is well known, the patentee remarks, that in the distillation of tar (or similar substances), the distillation appliances are submitted to the direct action of the fire, and that the products of distillation are there liberated separately and successively in proportion as the temperature of the substance under treatment approaches their respective boiling points. It is also known that, instead of the ordinary retorts, it has been proposed to employ—for the fractional distillation of the primary material—inclined tubular distillers or retorts, "in order to cause the spontaneous descent of the substance treated." The present invention has for its object improvements in these tubular retorts and their arrangement, so that the tar is caused to pass in succession from the first to the last of the retorts constituting a battery arranged in a general horizontal plane, in such a manner that all the retorts of the battery operate in continuous communication, and not independently one of the other. The retorts are heated to a temperature constantly increasing from the first retort to the last one, which latter is arranged "in closest proximity to the source of heat."

The apparatus shown is one resulting from the application of the invention to an existing installation of a battery of tubular retorts operating independently, and which it is desired to group into a continuous series. Fig. 1, in the left-hand half, is a front elevation, and, in the right-hand half, a vertical longitudinal section of two batteries, each comprising five retorts, symmetrically arranged and coupled to a single furnace. Fig. 2 is a horizontal section. Figs. 3 and 4 are cross sections.

The coal charged at A falls upon the grate B, where it is kindled, and its combustion is supported by the air admitted through an adjustable

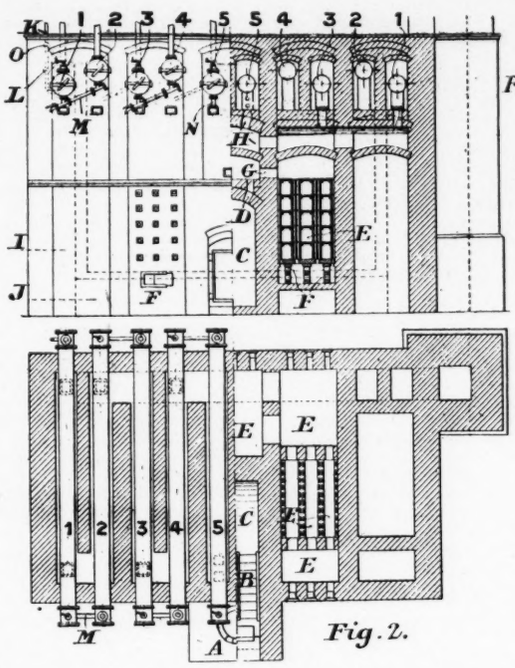


Fig. 2.

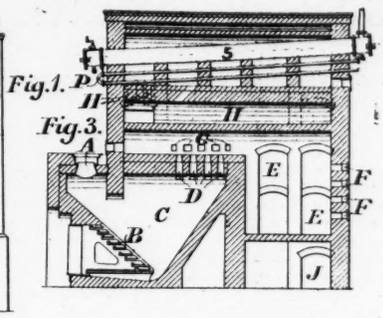


Fig. 1.

Fig. 3.

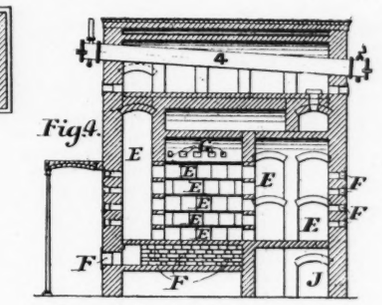


Fig. 4.

air-port. The combustion is kept incomplete and such that the products are combustible gases intended to burn completely later on, duly mixed with a suitable quantity of air coming from an auxiliary admission port, in order that they may then yield their entire useful heating effect to the retorts. Thus from the furnace C the combustible gases pass through the apertures D into the chamber E, where they mix with the auxiliary air supply admitted through the inlet F, and, passing through other apertures and vertical conduits formed by cavities in the hollow bricks, reach the mixing-chamber through the openings G. The combustible gases brought into contact in this manner with the air are completely consumed, and the products of combustion pass into the distributing passage. From this latter the products of combustion become distributed into two currents, each of which rises beneath the retort 5 of each of the two batteries. Each current traverses a zig-zag flue, passing over the whole length of its walls and successively enveloping the retorts in the direction of their length, and each of them in the direction opposite to the preceding. Finally each of the currents descends into the flue I; and the current furthest from the chimney traverses the horizontal flue J and rejoins the other—both proceeding to the chimney, which is capable of furnishing a good draught.

What has been described is the normal path of the products of combustion; and the heating will be greatest at the retort 5, and constantly decrease to the retort 1, which will be the least heated. It is, however, possible, at a given moment, to supply some one of the retorts with a larger amount of heat, or to diminish the heat beneath a retort, or the temperature of the combustion gases.

Each retort is arranged in an inclined position in order that the material under treatment may descend automatically; and, for the better utilization of the heat, the inclination is such that the material travels in the opposite direction to the movement of the products of combustion—that is to say, the retorts are arranged with their lower extremity at the side where the products of combustion arrive. The result is that these products also more readily pass over the retorts (especially at the lower part) from their lower to their upper extremity. The inclination of each retort is therefore opposite to that of the adjacent retorts.

The path of the tar under treatment is as follows: From a reservoir placed at a sufficient height, the mass descends by gravity into the pipe K, forming the outlet from the reservoir, and (its quantity being regulated by a cock) flows into the funnel L supplying, by the intermediary of a syphon, the retort 1 at its upper extremity. The tar advances slowly through the retort towards its lower part, from which a vertical connection, provided with a valve, causes it to pass to the ascension pipe M, communicating with the upper extremity of the retort 2. The mass traverses this latter in the same manner as retort 1, and by means of an equivalent device passes into the retort 3, and so on in succession to the retort 5. From the lower extremity of this last retort the connection N finally discharges the unvolatized residue of the mass treated into a collector. The various communication pipes, owing to their arrangement, form syphons between the retorts.

Owing to this arrangement, the mass under treatment assumes a general level in the retorts, which permits of its very slow and uniform progress, and in a fractional manner it is deprived in each retort of the portion of its constituents volatilizable at the degree of temperature of this particular retort. The cock O regulates the admission to the exact quantity, which should be supplied continuously, and valves serve to regulate the flow so as to prevent it from leaving each retort before it has yielded up all the products corresponding to such retort—that is to say, they prevent losses due to passing off with the residue, at the same time that they permit of obtaining this latter at a proper degree of concentration. They also serve to isolate the communication pipes, in order to clean and unstop them if necessary.

In the distillation of tar, there will be obtained: (*a*) By fractional distillation—from the retort 1, the essences and a portion of the ammoniacal water; from the retort 2, the light oils and the ammoniacal water in excess; from the retort 3, the medium oils and the naphthalene; from the retort 4, the heavy oils and the naphthalene in excess; and from the retort 5, the anthracene oils and anthracene. (*b*) As residue, at the outlet from the retort 5, the pitch (resin) pasty, or concentrated, or dry, as desired.

It is advisable to inject superheated steam into the last retort (5) for the purpose either of accelerating the distillation and of assisting, with the mechanical displacing action of the jet of steam, in the extraction of the whole of the heavier oily products, which could not be effected by distillation alone at the progressively increased temperature, as described, or else of preventing the formation of red vapours exploding in contact with the air. A stream of steam is supplied to the serpentine coil P arranged beneath, or at the side of, the retort 5. The distillation may be accelerated by injections of steam into one or more of the preceding retorts also; but, of course, "this advantage is obtained at the expense of the efficiency and exactness of the breaking-up of the material into its elements."

Wet Meters.—O'Connor, H., of Edinburgh. No. 28,346; Dec. 23, 1904.

This invention—a modification of, or addition to, the wet meter described in patent No. 16,153 of 1902—has for its object to provide more easy access for the gas and for its passage when leaving, so that the drum revolves easier and can pass a greater quantity of gas owing to the reduced resistance offered to its passage and the reduced weight owing to the reduction in the material of which the drum is composed.

Inside the upper end of the drum is a cone, the inside of which is

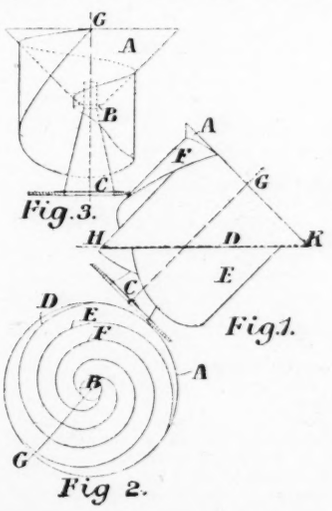


Fig. 3.

Fig. 1.

Fig. 2.

constantly open to the incoming gas and the lower side of which is below the level of the water, or other liquid, sealing the drum in the case. To this cone are attached three or more helical divisions; so that each compartment in turn is completely submerged and in turn opened to the incoming gas. As the drum revolves, and the opening for the incoming gas passes below the level of the water seal, the opening from the drum is nearly at the level of the seal, and will in its turn allow of the escape of gas into the case of the meter, as the

compartment becomes completely submerged by the pressure of the incoming gas.

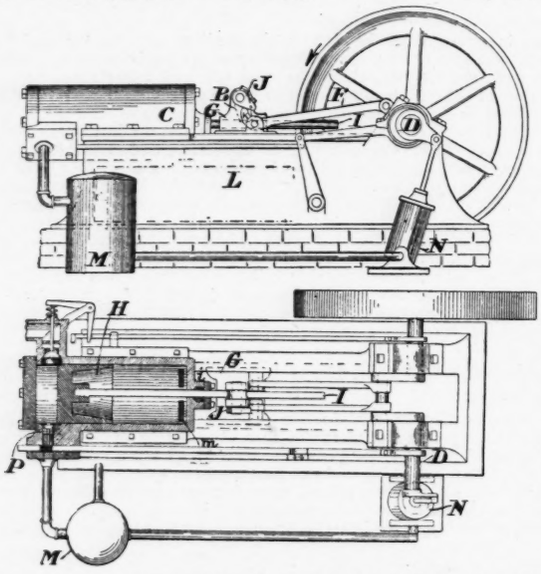
Fig. 1 (p. 547) shows the complete cylinder or drum; fig. 2, a plan from the under side; and fig. 3, the cylinder or drum with two of the helical divisions removed.

A is the cone, with a hole at the apex B, through which the inlet pipe C projects some distance, so as to bring the top above the level of the water seal. D, E, and F are the helical divisions. G is the axis of the cylinder or drum. In fig. 1, the division D is just about to leave the seal (the level of which is shown at H K), when the compartment enclosed by it will be opened to the outlet, while the inlet is below the level of the seal. Each compartment in turn is open to the inlet as it rises out of the water, and then the inlet becomes submerged and the outlet opened, as at D (fig. 1), and the gas expelled from the compartment as the latter is submerged in the water seal.

Gas-Engines.—Thompson, W. P.; a communication from the Free-Piston Gas-Engine Company, of Detroit, U.S.A. No. 1523; Jan. 25, 1905.

The shaft D is provided with a crank, united to the cross-head G by a connecting-rod F. A piston-rod I passes through a stuffing-box and through an aperture in the cross-head, on which is a clutch or pawl device B, adapted to engage the piston-rod I. The clutch is secured to a rock shaft supported in bearings on the cross-head. On one end of the shaft is a lever arm J. The clutch is pressed against the piston-rod by a spring; and the connecting-rod F is pivoted to the cross-head G. K is a finger which extends from the connecting-rod near the pivot, and is adapted to contact the lever arm J and lift the clutch B out of contact with the piston-rod when the connecting-rod is in a certain angular relation to the rod I.

A storage tank L, for compressed air, in any convenient position, communicates with the cylinder C in front of the piston through passages. It has so large a capacity that the pressure therein will not be greatly increased on the out-stroke of the piston. M is a tank for a compressed explosive mixture, which is supplied to the tank by a pump N, led to the cylinder C through a pipe at the rear of the piston H,



passing the inlet valve P and finally escaping after explosion through an exhaust valve which is actuated by eccentrics from the engine-shaft. The tank L is connected with the tank M by a pipe, in which there is a check-valve to prevent return flow, and so adjusted as to keep the pressure in the tank L somewhat below that of the tank M.

The operation of the engine is as follows: The fly-wheel, on rotation, lifts the clutch arm and draws the cross-head forward to its furthest position. The tongue of the clutch is then dropped and engages the piston-rod. During the operation, a charge has been admitted behind the piston from the tank M, pushing the piston slightly forward, and inserting a charge into the cylinder back of the piston. The tongue of the clutch being in engagement with the piston-rod, and the cross-head being near its furthest position toward the crank-shaft, the charge is ignited, and drives the piston and piston-rod through the cross-head against the resilient pressure in the tank L, and sliding the piston-rod under the clutch tongue. As soon as the force of the explosion is exhausted, the pressure on the piston pushes the piston back.

The tank M has a capacity so small that the discharge of one charge therefrom into the cylinder C will lower the pressure in the tank to equal, or nearly equal, that of the tank L, and the piston H will reach the limit of its stroke, due to the explosion of the gases from the tank M, with a fresh charge of explosive mixture behind the piston of a proper amount for a second explosion, owing to the inertia of the piston causing a slight vacuum in the cylinder.

Preventing the Fraudulent Use of Coin-Freed Gas-Meters.—Richardson, S. T., and Price, R., of Birmingham. No. 14,157; July 10, 1905.

In carrying out this invention—instead of making the slot in the meter of the proper size to admit a penny, and operating the meter by pennies—the slot is so small, by preference, that a half-penny will not pass through it. The meter is operated by metal checks or tokens notched in a peculiar manner so as to enter the slot, which is of smaller diameter than the check itself.

Fig. 1 is a sectional side elevation of the coin-slot place of the meter and the check or token for operating the meter. Fig. 2 is a plan of the coin-slot plate. Fig. 3 shows the check or token separately.

Fig. 1.

Fig. 3.

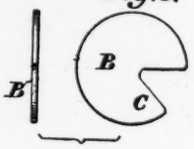
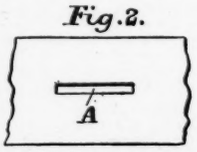


Fig. 2.



The coin-slot A in the coin-slot place is of such length that a half-penny cannot be inserted in it. The check or token B, which is made flat and very slightly thicker than a penny, so as to be of corresponding weight to a penny, has a somewhat V-shaped notch at one part, cut in so far that the distance between the bottom of the notch and the other side of the check or token will be less than the length of the slot A, and thus permit of the token being inserted and passed through the slot, as shown in fig. 1. This is readily done by first inserting the part C of the token into the slot, and then turning it in the direction indicated by the arrow, so that it ultimately drops down through the slot. Thus it is impossible for the meter to be operated by any coin, blank, token, or the like which has not the peculiar form described.

It will be understood, the patentees remark, that the tokens or checks are stamped with some particular device or mark so as to be identified from spurious ones; and "in distributing them could be purchased at a discount from the gas company or corporation owning the meters, or from shopkeepers or publicans or other people who have purchased them from the company or corporation at a discount. Thus, if the system were properly adopted, the companies or corporations would receive payment for their gas before the same was consumed, and they would have a large accumulation of funds on which they could receive interest instead of, as at present, having a large number of pennies locked up in the meters."

Incandescent Bodies.—Reeser, H., of Berlin. No. 16,018; Aug. 4, 1905.

This invention has for its object to make incandescent mantles of less easily destructible substances than usual—such as metal—and to impart to them a "largely increased durability."

The mantle is made of "a substance, or coated with such, which is found in platinum ore," which "contains, in addition to platinum, besides other substances, also iron, osmium, iridium, palladium, ruthenium, and rhodium." If, says the patentee, these metals be extracted from the platinum ore, "a material remains which has the property of illumination in a flame and of producing a fine light. This material has metallic properties, and may be called X metal."

For obtaining this metal, as part of the present invention, the iron contained in the platinum ore is first preferably separated from the ore bodies by a magnetic separator. The platinum ore is then treated with hydrochloric acid and nitric acid in a water bath until the aqua regia added no longer becomes coloured red. This yields Solution A, which contains (1) platinum, (2) palladium, (3) rhodium, (4) ruthenium, (5) iridium, and (6) the metal X. The osmium and iridium particles are contained in the undissolved residue, which is filtered and the filtrate calcined, leaving osmium. Solution A is diluted with 35 parts of distilled water and filtered; iridium remaining behind in the filter and being obtained after calcination of the filter. The remaining solution is precipitated with aqueous ammonia, but only after it has been ascertained how much aqueous ammonia must be added in order that only platinum shall be precipitated as a clear yellow precipitate.

The solution remaining after the precipitation of the platinum is called Solution B. The precipitated platinum is filtered, the filter calcined, and the platinum obtained as clear gray, spongy platinum.

Solution B is then subjected to a further treatment. It is evaporated on a water bath, so that only about one-third of its volume remains. Zinc (preferably in a granular form) is then added to the solution, and also some hydrochloric acid. The mixture is allowed to stand until it no longer effervesces—in about twelve hours. When bubbling or effervescing no longer takes place, the mixture is diluted with distilled water in such a way that the acids no longer attack the filter paper. Palladium and ruthenium, which have dissolved together, are deposited in the filter as a dark black precipitate. The solution then remaining may be called Solution C. The precipitate is removed by washing from the filter and dissolved in fluoric acid or any similar acid, such as hot chemically pure hydrochloric acid. This solution is evaporated and yields ruthenium, while palladium may be obtained from the precipitate after filtration and calcination.

Solution C is evaporated to half its volume; and then to this volume there is added cyanide of mercury and 95 per cent. alcohol. The solution is allowed to stand for some hours in a water bath and filtered. The precipitate, after calcination, yields rhodium.

The solution remaining after the separation of the rhodium is evaporated and calcined, and yields the desired metal X, which is soluble in aqua regia, but only by the hot process. Otherwise it is apparently insoluble, and is fusible at 2000° Celsius, and in a molten condition has a clear silvery appearance.

The incandescent mantles may be made either by forming them entirely of the metal, or making them of "another material, which, however, does not need to have the property, but is intended to have it, of increasing the illuminating power of a flame," and this body be coated with the metal X.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by Correspondents.]

Luteless Purifier Covers.

SIR,—I note in your article last week on the Southern Association meeting that, in reviewing the discussion on Mr. Humphrys' paper, you say my suggestion with regard to the system of joists is somewhat of a makeshift. I am afraid this is due to a misunderstanding, probably on account of my not having made myself sufficiently clear.

I certainly did not intend for one moment to suggest that such a system of joists as I mentioned should be used simply for the purpose of providing a support for the planks on which the barrows of oxide could be wheeled. What I really intended was that, in a box in which the "decking" was done away with, it would probably be thought advisable to make use of such a system to act as tie-bars for strengthening the box. In some boxes I have lately designed, I have carried every other standard up to the full height of the box, and have run tee-bars from one side of the box to the other on the top of the standards. These being fastened to the sides and joined together throughout their length, you will see, act as tie-bars to the box, and would be suitable for supports for the gangway which I mentioned. The box would be tied in the other direction by the tee-iron bearing-bars in the next layer, by providing certain of the tee-iron bearing-bars in the tier immediately below with fastenings, whereby they could be joined up to the standards and to the sides of the box, so as to practically form one continuous length.

Croydon, Nov. 18, 1905. J. W. HELPS.

SIR,—I see in your last issue, that you invite communications with respect to the mode of jointing purifier covers.

I have laid down several of these purifiers, and prefer to make the covers the full size of the boxes. I have four of these purifiers, measuring 15 feet by 20 feet, with the covers made in one piece; and they are merely lifted vertically without being pulled aside horizontally. To joint them, I provide bolts at every 6 inches right round, set in the cast-iron flange of the boxes, leaving holes in the N iron of the cover. One bolt at each corner is made longer than the others, serving as a guide-bolt; and we put nuts on to as many bolts as experience proves to be advisable—one every 2 or 3 feet. If on increasing pressure, we find another nut desirable, it can be put on where required. Our rubber is simply a $1\frac{1}{4}$-inch by $\frac{1}{4}$-inch flat strip, placed on loose.

I have a contempt for all the fancy devices of sticking the rubber on to the cover, and of the self-locking ideas. If one were going to change a purifier two or three times a day, it would be worth while paying attention to these points; but a thing that has only to be done once a week, and in many cases (as in my own, for instance) once in three or four months, I think it is absurd to complicate matters, when you have so simple an arrangement to hand. The extra expense and complication and risk involved, is merely to save a boy half-an-hour's work slackening a few bolts at long intervals.

An objection to fastening the rubber is that it expands in course of time; but when the rubber gets loose, we can easily cut off a short piece when changing. After five years' experience of them—during which time we have not had to renew the rubber at all—I should not for a moment think of reverting to the old pattern of purifiers, and certainly shall not adopt any complicated locking-device.

5, *Westminster Chambers, Nov.* 15, 1905. R. BRUCE ANDERSON.

SIR,—Referring to the paper read at the last meeting of the Southern District Association of Gas Managers, and your offer in reference to same, I wish to add my testimony to the convenience and safety of "Green's" purifiers, which were erected here in 1901, and a full description of which was given in the "JOURNAL" in May and June, 1902, when dealing with the alterations and extensions at these works.

The purifiers consist of four distinct shells or tanks, having a division separating same into twin purifiers. Each distinct purifier, when divided, measures 48 ft. long by 18 ft. wide by 6 ft. deep, having two openings to each division, 18 ft. 6 in. long by 12 ft. wide, to which a cover is secured in position by thirty-two $\frac{7}{8}$-inch collar bolts with nuts made of a special forging, so simply arranged that they can be removed and replaced by others in five minutes. The joint between the purifier cover and the top consists of half-round rubber, and is fastened to the box by proper rubber solution. It is kept soft, and prevented from sticking, by the use of tallow and blacklead. I have every reason to believe the rubber will last for many years.

As regards filling or emptying the boxes by barrow or otherwise, I can assure those who have any hesitancy in adopting luteless purifiers, with rubber joints or the fastenings I have in use, that they need have no fear as to the superiority and utility of these purifiers as compared with the old style of water-lute boxes.

Walsall, Nov. 18, 1905. B. W. SMITH.

Gas-Heating Appliances.

SIR,—Will you kindly allow us to reply to the letter from Messrs. John Wright and Co. in your last issue?

We cannot accept the laws laid down by them as applying to our "Startling Development." We use the air-adjustment to control the conditions of combustion, and the gas adjustment to meet the requirements of the present wide range of pressures. But these adjustments are secondary to the "unique and scientific" arrangement of the flame with the fuel, the "exactness" of which bears favourable comparison with the mantle and flame of the incandescent gas-light.

We can maintain a good 10-inch fire with from 12 to 18 cubic feet of gas per hour, at any pressure.

Leeds, Nov. 15, 1905. WILSONS AND MATHIESONS, LTD.

Pressure Raising at the Dover Gas-Works.

SIR,—We have been requested by Mr. R. Herring, of the Dover Gas Company, to state that at the time he ordered the gas-pressure raiser for Dover, in March, 1904 [as described and illustrated in the "JOURNAL" for Dec. 13 following, p. 840], we assured him that this was the first turbo-fan that we had ever supplied for the purpose of raising the pressure of gas. This is correct. Furthermore, our engineers who had charge of this work were not aware that any of our fans had ever been driven by a direct-coupled De Laval steam-turbine, and used for gas-pressure raising.

Some months after the order for the plant had been placed with us, the attention of our engineers was called to the fact that one of our customers had attached a turbine to a pulley fan which had been supplied by us, and was using this converted apparatus for raising the gas-pressure in his mains. A description of the plant, thus converted from belt to turbo drive, was given in a paper read by Mr. W. E. Dean at a meeting of the London and Southern District Junior Gas Association on April 14 last. [See "JOURNAL," Vol. XC., p. 168.]

Nov. 17, 1905. STURTEVANT ENGINEERING COMPANY, LTD.

Mr. ALEX. WILSON, Engineer-in-Chief to the Glasgow Corporation Gas Department, in the course of a letter, incidentally alludes to the discussion at the Southern meeting. He remarks: "I am very pleased with the results we have obtained with our Parsons turbo-exhauster, and am at present putting down a second machine of the same size—viz., 750,000 cubic feet per hour—to work against a total pressure of 24 inches. I do not know of any fan which will do effective work at this pressure."

Mr. SAMUEL CARPENTER writes: "I note in your report of the discussion on Mr. Herring's paper at the Southern District Association of Gas Engineers and Managers' meeting, I said: 'There was just one point . . . . and that was the low expenditure, namely 0·6d.' It should read, 'and that was the low *fuel* expenditure, which, taken at 7d. per cwt., equals 0·06d. per 1000 cubic feet exhausted.'"

Commissions Direct and Indirect.

"A FIRM OF GAS-STOVE MAKERS" write (under date of Nov. 15) as follows:—

Knowing your interest in demands which manufacturers frequently receive regarding gratuities for "beanfeasts" and other purposes, we have ventured to send you particulars of a transaction which has just come under our own notice.

We received a few days ago an order from a corporation gas official for a gas-cooker, accompanied with the request that, as the stove was required for his own use, and that he "did not receive any commission on the sale of our stoves," we would supply on favourable terms. We ignored his reference to "commission," and replied that, in view of the stove being required for use in his own household, we would be pleased to finish same specially for him and supply at a special discount. In reply we have received a letter, of which we enclose you a copy.

Should you desire to make use of this in any way, you are quite at liberty to do so, as far as we are concerned.

[ENCLOSURE.]

Corporation Gas-Works, ————

Nov. 14, 1905.

Dear Sirs,—Your note to hand, and I am disappointed at the price of the cooker.

It is not long since I got the offer of a cooker and commission from another firm, to canvass their goods; but I stuck to you, thinking you would be as generous as other people. I find on counting up what I have sold for you since I came here, that if you had allowed the commission I was offered, I could have bought the cooker and have a balance left.

At the exhibition here in ———— all the cookers that were disposed of were sold by me before the canvasser came. The people were only waiting to see what size they would take; and the canvasser got the commission, and I got nothing—not even thanks, for my work.

Please let me have a reply as soon as possible, and I will know what to do.

Yours sincerely,

LEGAL INTELLIGENCE.

MANCHESTER ASSIZES.—Monday, Nov. 13.

(Before Mr. Justice BRAY, *and a Jury.)*

Partington v. Leigh Corporation—Damages for a Gas Explosion.

This was an action in which Mrs. Partington, of Lytham, the owner of three cottages at Leigh which were wrecked by an explosion of gas on May 23, claimed damages from the Leigh Corporation on the ground that the occurrence was directly caused by their negligence.

Mr. LANGDON, K.C., and Mr. RHODES appeared for the plaintiff; Mr. HORRIDGE, K.C., and Mr. BYRNE for the defendants.

Mr. LANGDON, in opening the case, said the premises where the explosion took place were in Ellesmere Street, Leigh, and consisted of three cottages, one of which was occupied by a widow named Beresford. Outside Mrs. Beresford's house, and connected with the gas-main, there was a service-pipe which was corroded, and admitted of a serious escape of gas. This, it was alleged, in spite of repeated warnings, the defendants neglected to remedy, and the explosion took place, causing not only the destruction of the property, but the death of one woman. The service-pipe was laid over forty years ago by the original

Gas Company, and was under the direct control of the Corporation, as owners of the undertaking. In 1899, Mrs. Beresford had a slot meter fitted, and began to use gas, which came through this service-pipe. The pipe at that time, so far as was known, was sound. In 1901, after some work had been done to a street-lamp, an escape was noticed; and from then onwards there was always more or less a smell of gas. In 1904, when it began to be serious, the gas collectors were informed, as regularly as they came round; and complaints were also made at the gas office. But no attention was paid to the matter. Early in the present year, the escape became very serious. In March, the collector came round as usual; and Mrs. Beresford again complained to him. He examined the internal fittings, and said there was no escape. This was followed by a second examination in the same month by a gas inspector; and still no escape was discovered. Apparently it did not occur to the man to examine the service-pipe outside the house. Complaints were subsequently made to the officials; but they allowed the trouble to go on. On the day before the explosion, the escape of gas was especially marked in Mrs. Beresford's cottage and in the one adjoining; and she got a neighbour to call at the gas office. She, however, found the office deserted; but on calling again next morning, she saw a fitter (Mort), to whom she represented the serious state of affairs. Mort said: "I'll send a man down in time." Before the man arrived, the explosion occurred. Subsequent examination showed the corroded state of the service-pipe outside the building, and that gas had found its way under the flooring of Mrs. Beresford's house. The plaintiff had now had her property repaired; and she called upon the Corporation to pay the bill.

After evidence bearing out the statements of Counsel,

Mr. HORRIDGE submitted that there was no case to go to the Jury. There was no evidence, he said, of any duty on the Corporation, even though complaints were made, unless such complaints were in writing, as required by the statute. The corroded pipe was shown to have been laid in soil which formerly belonged to the owner of the property, but had been laid to the street and flagged over. Counsel thereupon argued that, unless acceptance by the local authority under the Public Health Act were proved, the mere dedication to the public of land laid to a street did not vest liability in the authority.

Justice BRAY: You do not dispute that Ellesmere Street is repairable by the Corporation?

Mr HORRIDGE: As to this part, I do. It may have been treated like the rest of the street, but property in the pipe remains with the owner of the ground.

Justice BRAY said the ownership of the soil had nothing to do with it.

After some further argument,

Justice BRAY said he was against Mr. Horridge on the points raised. There was a duty on the Corporation, apart from the statute, to take reasonable means to prevent gas from escaping so as to cause damage. The question remained whether the plaintiff had shown that there was in this case an obligation and a breach. As regarded the obligation, that must depend on whether they assumed control over the service-pipe, or had, in fact, control over it. There was evidence that they had. The question of negligence, and also that of control, were questions for the Jury.

Mr. HORRIDGE called two witnesses to show that the pipe had once been repaired and paid for by the owner of the property. The repairs appeared to consist of something done to a pipe immediately in connection with the meter, which was Corporation property. As this did not help his case,

Mr. HORRIDGE, without addressing the Jury, submitted to judgment for the plaintiff for £260, the amount claimed, and costs.

Subsequently, on Mr. Horridge's application, the Judge granted stay of execution, with a view to an appeal on the legal points raised.

POWERS OF WATER COMMISSIONERS IN CANADA.

Action by a Riparian Owner.

A suit which raised the question of the extent of the powers of the Water Commissioners of the City of London (Ontario) to interfere with the rights of riparian owners, came a short time ago before the Judicial Committee of the Privy Council, consisting of Lord Macnaghten, Lord Davey, Lord James of Hereford, and Sir Arthur Wilson. It was an appeal from a judgment of the Supreme Court of Canada reversing decisions of the Court of Appeal and also of the Chief Justice of the King's Bench Division of Ontario. The appellant was owner and occupier of lands adjoining the River Thames, in the province of Ontario, and of a water-mill operated by water from the river; and his complaint was that the respondents, the Water Commissioners, by the erection of a dam with flash-boards across the river at a point some miles below his mill, had penned back the water, with the result that in certain seasons of the year his lands were flooded and the water power of his mill was interfered with. There was no dispute that he had, in fact, been injured by the works of the respondents; but they contended that they were authorized by their Act to execute the works complained of, and that the appellant's remedy (if any) was to proceed by arbitration for damages under its provisions. After the case had been opened, a reference was, by consent, made by the Court to two engineers agreed upon by the parties to report upon the facts and to ascertain and report the extent of the damage (if any) the appellant had suffered. The Referees decided that he had sustained material injury both as a riparian proprietor and as a millowner. By the decree of the Chief Justice of the King's Bench Division, judgment was ordered to be entered for the appellant with a reference as to damages confined to six years before the commencement of the action, and the injunction asked for was granted. An appeal by the respondents from this decree was dismissed by a unanimous judgment of the Court of Appeal. The Supreme Court of Canada, by a majority of three to two, reversed the previous judgments, and dismissed the action with costs. The difference between the learned Judges of the last-named Court arose on the proper construction of section 5 of the respondents' Act (36 Vict., cap. 102, Ontario), which gives them authority to enter into the lands of any persons within 15 miles of the city, and ascertain such parts of them as they might require for the purposes of their water-works, and also to divert and appropriate any river, pond, spring, or stream which they should judge suitable and proper, and to contract with the owner or occupier for the purchase thereof, or of any privilege that might be required for the purposes of the works. In case of disagreement between the Commissioners and any parties affected by their operations, it was provided that it should be decided by three arbitrators. It was argued that the appropriation by the Commissioners of the appellant's land and water rights was not within their powers, because the dam complained of was not constructed and used for the purpose of storing water to be supplied for the use of the inhabitants of the city, but for generating power to raise the water to the required height. Their Lordships agreed with the opinion expressed by the majority of the Judges in the Supreme Court, that, assuming this to be so, the water was nevertheless required for the purpose of the water-works within the meaning of the Act; and that therefore the Commissioners would be acting within their powers in appropriating the appellant's land and water rights, provided they had taken the necessary steps for the purpose. The question was whether or not they had done so; and their Lordships came to the conclusion that they had not. They had not proceeded in accordance with the specific directions contained in their Act; and consequently the appellant had not lost his ordinary right of action for the trespass on his property. Their Lordships therefore advised His Majesty that the judgment of the Supreme Court should be discharged, and that of the Court of Appeal, confirming the judgment of the Chief Justice of the King's Bench Division, restored, with the variation that the damages should be confined to the period beginning six months before the commencement of the action; also that the respondents should pay the costs of the Supreme Court, and of the present appeal.

More Incandescent Gas Litigation.

In the Chancery Division of the High Court of Justice last Friday, Mr. Justice Joyce had before him the case of *New Inverted Incandescent Gas-Light Company, Limited, v. New Export Incandescent Gas Company*. It was an application by Mr. Gordon, on behalf of the plaintiffs, for a stay of proceedings in the action until after the Court above had heard and decided the appeal from the decision of his Lordship. He said the action covered, to a certain extent, the same ground as the previous case—one issue being that of infringement. The plaintiffs were willing to treat the issue of infringement as controlled by the decision of the Appeal Court; and if the appeal went against them, to consent to judgment on that issue in this action, and to pay to defendants the costs of particulars of objections as if they had proved them. Considerable expense would be saved to all parties by this arrangement. Mr. Grey, for the defendants, objected to any delay in the trial. He said the plaintiffs had issued writs broadcast all over the country, and, among others, one against his clients. The infringement alleged was different from that in the previous case; and he desired that the action should be speedily disposed of, as, in the meantime, his business was being injured. Plaintiffs ought not to have started fresh actions until after the appeal in the test-action had been decided. His Lordship said, as the defendants objected, he could not accede to the application. A person against whom a patent action was brought had a right to have it speedily heard. The application would be refused, with costs. On request, his Lordship granted leave to appeal.

Liability for Injury Caused by a Stopcock.

At the Westminster County Court a short time ago, his Honour Judge Woodfall had before him the case of *Streeter v. Metropolitan Water Board*, one Blackmore being a third party. The plaintiff claimed damages for personal injuries sustained under the following circumstances: On the night of Dec. 25, 1904, she was entering the house where she lodged at Greenwich when she stumbled over a stopcock box and sprained her ankle. Blackmore was the landlord of the house. So far as the Board were concerned, liability was denied on the ground that the boxes were supplied to builders, and they fixed them and were liable for any defect. The Greenwich Borough Council had not taken over the road, and the box stood from $\frac{3}{4}$-inch to $1\frac{3}{4}$-inches above the ground; the pathway being very uneven. It was argued, on behalf of the plaintiff, that the provision of stopcocks was a matter for the water authority under sections 28 and 32 of the Water-Works Clauses Act, 1847. Whether or not the Board actually fixed this particular box did not matter, as it was there for the joint use of the Board and the consumer. Though sold to, and fixed by, a builder, the liability remained with the water authority; the box being part of the apparatus by which water was supplied to the house under the powers given by Act of Parliament. It was contended that the Board had been guilty of negligence by not guarding against an obvious danger, because it must have been known that the soil in the vicinity of the box would be worn or washed away. The Water-Works Clauses Act imposed upon the water authority the duty of keeping all their conduits, &c., in repair. On behalf of the Board it was submitted there had been nothing in the evidence to show that they had anything to do with the cock. If anyone was liable, it was the person or authority responsible for keeping the road in proper order. For the landlord, it was contended that these stop-cocks were always fixed outside a house, and obviously so that the authority could get at them; and owners of property were required to have them under the Board's regulations. Their object was to prevent waste of water. A further point submitted was that the authority responsible for the thing which became dangerous, being where it was, was liable for any damage sustained therefrom. The landlord had no knowledge anything was wrong; nor had he any authority to open a road. On Wednesday week his Honour delivered his reserved judgment. He said the matter had had his most serious consideration, and he had come to the conclusion that there was no evidence that the box had not been properly fixed, and therefore the reason it projected above the surface was that the road had been worn away. On the question of the ownership of the box, he had decided that it belonged to the owner of the property. It was simply to put a check on the water supplied to that particular house. Accordingly, he gave judgment for the defendants, with costs. Counsel for the plaintiff asked for a month's stay of execution, and it was granted.

MISCELLANEOUS NEWS.

PROJECTED GAS LEGISLATION.

Removal of Sulphur Restrictions.

Statutory notice has been given for the Bill to be promoted by a number of gas companies to obtain next session the removal of the restrictions relating to sulphur in gas. The scope of the Bill has been already indicated in the "JOURNAL;" and the notice consists almost entirely of the names of the companies concerned. It sets forth that the intention of the promoters is to obtain the repeal of the statutory provisions or restrictions as to the quantity of, and liability for excess of, sulphur compounds (other than sulphuretted hydrogen) contained in the gas supplied by the following Companies: British (in respect of their Hull, Norwich, and Staffordshire Potteries stations), Cambridge University and Town, Harrow and Stanmore, Hastings and St. Leonards, Hampton Court, Ipswich, Newcastle-on-Tyne and Gateshead, Reading, Richmond, Shrewsbury, Tunbridge Wells, Walker and Wallsend Union, Waltham Abbey and Cheshunt, Wandsworth and Putney, and Wolverhampton. The various Acts of these Companies which it may be necessary to repeal or amend are set out.

Reduction of Illuminating Power.

The South Suburban Gas Company have given notice of their intention to renew their application to Parliament for the alteration and repeal of provisions of the Crystal Palace District Gas Acts, 1873 and 1893, with respect to the quality and illuminating power of gas to be supplied by the Company, and the making of new, and the varying of existing, provisions with respect to the method of testing the gas. The Bill to be promoted will or may provide for an alteration of the standard price and of the rate of increase or decrease of the dividend which the Company may pay under the sliding-scale applicable to them; and it will extinguish all such rights and privileges as would interfere with any of its objects, and will confer others.

RAILWAY SIDINGS IN GAS-WORKS.

Conference of Representatives of Scottish Corporations.

Last Friday, a meeting of representatives of gas undertakings of Scottish Corporations was held in the Board-Room of the Gas Commissioners of the Edinburgh and Leith Corporations, under the presidency of Judge Bryson, the Convener of the Works Committee of the Edinburgh and Leith Gas Commissioners. There were present representatives from Glasgow, Dundee, Aberdeen, Greenock, Falkirk, Perth, and Edinburgh. The Chairman explained that the object of the meeting was to consider the resolution which had been unanimously come to by a meeting of Scottish Gas Engineers held the previous week, relative to the probable effect of the proposed draft regulations upon their respective undertakings, and to determine what action, if any, should be taken to protect their interests. After fully considering the matter, it was unanimously resolved that joint action should be taken by the Corporations represented, and that the legal expenses incurred in connection therewith, so far as they related to the expenses of Agents and Counsel in London, should be borne *pro ratâ* by the respective undertakings, in the proportion of their annual revenues from the sale of gas. The following resolution was also unanimously agreed to, on the motion of the Chairman, seconded by the Lord Provost of Perth:—

> At a meeting of representatives of Scottish Corporations whose interests are affected by the draft regulations for the use of locomotives and waggons on lines and sidings in or used in connection with premises under the Factory and Workshop Act, held in the Board-Room of the Edinburgh and Leith Corporations' Gas Commissioners, 25, Waterloo Place, Edinburgh, on the 17th of November, it was unanimously resolved that, in view of the large expenditure that would have to be incurred in adapting their existing works or works under construction to the requirements of the proposed regulations, the Home Secretary should be approached with a view to exempting the Scottish Gas-Works from the requirements of the proposed regulations, particularly in view of the fact that there is insufficient evidence to show that the works in question are dangerous, or render their employees liable to undue risk in the carrying out of their duties.

The meeting afterwards committed to the care of Mr. Thomas Bowers, the Town Clerk of Glasgow, and Mr. J. M'G. Jack, the Clerk to the Edinburgh and Leith Gas Commissioners, the duty of making the necessary arrangements for the proper representation of the associated Corporations at the inquiry to be opened in London to-morrow (Wednesday). Mr. Herring was requested to communicate the result of the meeting to the Corporations concerned, and make arrangements for a meeting of representatives of the associated Corporations prior to, or immediately after, the first day's proceedings, in London.

THE PUBLIC LIGHTING OF FINCHLEY.

A Preference for Municipal Electricity.

At a Meeting of the Finchley Urban District Council on Monday of last week, a lengthy discussion took place upon the report of a Joint Committee of the Highways and Electricity Committees who had been appointed to consider an offer of the North Middlesex Gas Company regarding the public lighting Exclusive of those in the Gaslight and Coke Company's area, there are at present in the district 848 public lamps—534 electric; and the remainder gas, belonging to the North Middlesex, Southgate, and Barnet Companies. Of the gas-lamps, 201 are under the control of the North Middlesex Company, and the present annual charge for them, at £3 os. 7d. each, is £608 17s. 3d. Under the Company's latest offer, however, the charge would have been reduced to £2 10s. per lamp, which would have represented a saving of £106 7s. 3d. The Electricity Committee proposed that, from Jan. 1, a charge of £3 per lamp per annum be made for the same number of lighting hours as at present, of the whole of the 848 lamps, which ultimately would be lighted by electricity. Meantime, the gas-lamps not in the Gaslight and Coke Company's area should be lit with incandescent gas, using the same type of burner as that proposed by the North Middlesex Company—viz., 3½ feet per hour—such charge to include the whole responsibility for lighting, extinguishing, cleaning, painting, and ordinary repairs. On the basis of this uniform charge of £3 each, there was a saving shown of £140 a year; but the alterations would necessitate a capital charge of £170, which it was proposed should be repaid by ten half-yearly instalments. The Joint Committee recommended the acceptance of the Electricity Committee's proposal, on the following conditions: (1) That 25 per cent. more illumination should be given than was afforded by the present electric lamps, other than those on the centre-poles in the Great North Road; and (2) that the gas-lamp should be lighted on the incandescent system as soon as possible or converted to electricity.

Mr. Rabbidge (who moved as an amendment that the whole question of street lighting should be referred to the Highways Committee to report) pointed out that the present cost of electric lighting was £3 5s. per lamp of 32-candle power. This, under the new agreement, was to be £3 per lamp of 40-candle power; but the North Middlesex Gas Company's offer was £2 10s. per lamp of from 50 to 70 candle power. If they discontinued their electric street lighting, there would be a saving of £540 a year—that was to say, if the recommendations of the Joint Committee were approved, it meant a subvention to the Electricity Department of this sum annually out of the rates. Mr. Fisher said that all the ratepayers were interested in was having a good light The present electric lighting in the streets was hardly noticeable at a distance; but now the Electricity Committee were to give 25 per cent. more light, and it was only fair to let them have a chance of showing what they could do. It was always open for the Council to bring up the question of street lighting again. This view prevailed with the Council; for only the mover and one other member voted for the amendment—the Joint Committee's recommendations being afterwards approved.

WESTON-SUPER-MARE COUNCIL AND THE GAS-WORKS.

The Weston-super-Mare Urban District Council, after a lengthy discussion, have resolved to take steps towards the promotion of a Bill in the ensuing session for the purchase of the Gas Company's undertaking. A meeting was held last Wednesday for the purpose of considering the report of a financial expert—Mr. Tryon—regarding the proposal to acquire the works; and it was after this gentleman's views had been laid before them that the decision stated was arrived at. Mr. Tryon, in his report, mentioned the probable purchase price of the undertaking as £151,580, based on a 5 per cent. maximum dividend for thirty years—such amount including compensation for compulsory purchase, debentures, the costs of arbitration, transfer, and the liquidation of the Company, undivided profits, surplus stock in trade, &c. On the calculations provided by Mr. Tryon, it appeared that the probable annual sum payable in respect of interest and sinking fund would amount to £8330, and that the probable revenue to be derived from the sale of gas would amount to £6000; leaving a deficit to be found out of the rates for the first year of £2330. Having regard to the steady development of the town, however, he thought the profits could be increased some £500 per annum; so that within the next four or five years the revenue would be sufficient to pay interest and sinking fund charges. The proposal to promote the Bill was carried by seven votes to five; and a statutory meeting of the ratepayers will shortly be convened for the purpose of securing their sanction to the scheme.

A SUCCESSFUL YEAR AT NANTWICH.

The balance-sheet prepared by Mr. E. J. Fussell, the Secretary of the Nantwich Gas Department, showing a net profit on the first year's working of £275, is considered very satisfactory. The expenditure on manufacture was £2514, and on distribution £232; the total outlay on revenue account being £3286. The receipts from public lighting were £375, from ordinary and prepayment meters £5788, from meter-rents £115, from cooker-rents £82, and profit on fittings £184. When moving the adoption by the Urban District Council of the minutes containing this balance-sheet, the Chairman of the Committee (Mr. W. Lea) conveyed the congratulations of the Committee to the Manager (Mr. D Davies), the Secretary, and all who had been associated in producing the good results shown. The quantity of gas made and sent out was 35½ million cubic feet, which was an increase on the year's working of 1½ million feet. The efficiency of the management of the works was evidenced by the fact that the make of gas per ton of coal was more than 1000 cubic feet above the average. He congratulated the Council on the fact that the works had made a net profit of £275 after paying away considerable sums. Among other items, £3186 was paid as interest on capital, £968 to the sinking fund, £153 in rates and taxes, and about £400 for maintenance of works, &c. He regretted that, for the time being, the ratepayers would not derive any great advantage from the works. The enormous amount of the debt owing on account of the purchase prevented any cheapening of the price of gas for some time to come; but if they could only maintain the present efficiency in the management, the town would eventually reap a great advantage from having secured possession of the works. There were no weak spots in the balance-sheet or in the reports submitted to the Committee. Mr. Heap admitted that the profit they had made was a matter of great surprise to him; while Mr. Harlock remarked that it was gratifying to those who went to London, and heard the enormous figure put upon the works, to find that their fears of loss on the transaction had no foundation. All who spoke complimented the officials on the excellent results attained.

A GAS EXHIBITION AND SOME OF ITS FEATURES.

Small, but Representative and Attractive.

If among our readers there are any who desire to learn something about the extent of the Croydon Gas Company's district, now that they have annexed the area formerly supplied by the Caterham Gas Company, there is no better way of doing so than by paying a visit to the remarkably attractive exhibition on a small scale that is this week being held in the Drill Hall, Caterham. The amalgamation of the smaller Company with the larger only took place on the 1st of July last; and already the business energy of the Croydon Company has brought together this exhibition of the modern development of gas lighting and heating and cooking appliances for the special behoof of the residents in Caterham Valley, in the hope that the effect may be educational, that fresh business may be secured, and that peradventure there may be a few converts from electricity to gas. For it so happens that an Electric Lighting Company, fathered by the Edmundson Company, have been operating in Caterham for three years. Unconsciously the Directors and Mr. J. W. Helps, the Engineer and General Manager of the Croydon Gas Company, made a happy hit in fixing the date for the opening of this exhibition on the first anniversary of the opening of the celebrated Earl's Court Exhibition; and the best that we can wish for the Caterham show is that it may have a proportionate success to its great precursor. As on Saturday one looked from the stage of the Drill Hall down the rows of stands, there was seen in miniature the almost perfect arrangement of the Ducal Hall, and to be noted were several of the names of firms who took such prominent part in that memorable display. We are under the necessity of reducing this account of the Caterham exhibition to as narrow a compass as possible; but there are certain things about it of which we must make point.

The Opening of the Exhibition—Some Figures as to the Croydon Company's Progress.

The opening was kindly performed on Saturday by Mr. W. Garland Soper, J.P., C.A., Chairman of the Caterham Urban District Council; and he was accompanied by some of his colleagues. Presiding at the opening was Mr. Charles Hussey, J.P., the Chairman of the Croydon Gas Company, and he was accompanied by the Deputy-Chairman (Mr. Thomas Rigby), Dr. Adams, and Mr. Percy G. Hall, the late Chairman of the defunct Caterham Gas Company. Several prominent local residents (including Major-General Sibley, J.P., and the Rev. S. Milledge) were also present. On the platform, too, were Mr. Helps, the Secretary of the Croydon Company (Mr. W. W. Topley), the Chief Assistant-Engineer (Mr. A. Caddick), and the District Superintendent (Mr. W. J. Sandeman), who had thrown himself heart and soul into the organization of the exhibition, under Mr. Helps's direction.

A few words of introduction by the Chairman brought Mr. Soper before the interested audience. In declaring the exhibition open, he said he wished it to be known that he was performing this duty not in his official, but his individual capacity; for in the Council over which he had the honour to preside, they knew neither gas nor electricity. They did the business of which they were placed in charge with the single object of benefiting the inhabitants. In his subsequent remarks, he showed that he appreciated the expansive character of the gas industry, and the advances it had made in the economical and varied use of its chief commodity.

In proposing a vote of thanks to Mr. Soper, for his kindness in opening the exhibition, the Chairman gave some information as to the progress of the Croydon Gas Company. He said the appreciation by the residents in the Company's district of the special facilities which had been given for using gas under the best conditions was shown by the progress made by the Company in recent years. As an illustration, he took the last six years. The number of consumers had increased from 13,900 in 1899 to 24,600 in 1905—an increase in the six years of 10,700; the number being thus nearly doubled. The number of cooking and heating stoves hired from the Company on their special terms had grown from 5700 in 1899 to 14,000 in 1905—an increase of 8300 in the six years, or not far from threefold. The number of fittings (such as brackets, pendants, and boiler-rings) hired from the Company by their prepayment consumers had grown from 17,500 in 1899 to 48,300 in 1905—an increase in the six years of 30,000, again nearly trebling the number. In the comparatively short time that the gas supply of Caterham had been administered by the Croydon Company, the number of consumers had been increased by 54, and the number of fittings supplied to consumers on the prepayment system by 228. The benefits that had been conferred could not fail to produce good results. By the amalgamation, the price of gas had already been reduced from 3s. 10d. to 3s. 4d., and the value of the holdings of the shareholders had also risen.

In seconding the motion, Mr. Helps pointed out that their friend Mr. Soper, in opening the exhibition, was not doing anything derogatory to his position, seeing that he was helping an industry that was not a thing of yesterday, and one which had shown most remarkable prosperity. It was, he said, just 95 years ago that the Chartered Gas Company obtained their first Act for the lighting of London; and their capital was then £200,000. The same Company to-day had a capital of £28,000,000; while the capital invested in gas undertakings in the United Kingdom now was probably nearer 130 millions than 120 millions. Alluding to the allegations that gas was insalubrious on account of the sulphur it contained, Mr. Helps quoted from the report on this question of Mr. Otto Hehner and Dr. Rideal (which was presented to the Departmental Committee of the Board of Trade), and showed that in the air of the rooms in which they experimented with burning gas, not always under the best or normal conditions, there was no more sulphur than in the outside air. Then Mr. Helps went on to point to a set of graphic models and burners which showed the progress that had been made in the illuminating value realizable from gas. On a long rail of gas-pipe were the burning exponents of the advance—commencing with a burner giving ¼ candle per cubic foot of gas consumed onwards to 3·3 candles for the argand; and then the tremendous jump to 19 candles for the incandescent burner. Cooking, heating, and motive power also came under review, and Mr. Helps finished by thanking all who had rendered assistance in presenting to the residents of Caterham such a complete and interesting exhibition.

The motion was heartily passed, and Mr. Soper responded.

The Company's Exhibits, and Some Remarkable Testimony.

In organizing an exhibition of this kind, the Croydon Company have shown that a large amount of relief can be given to firms who kindly assist with exhibits by drawing largely upon their own show-rooms and resources. In this exhibition, the Company have furnished a considerable assortment of goods. On one stand, they are exhibiting samples of all the stoves and other appliances that they let on hire and fix free, together with models of meters (showing working parts) lent by Messrs. Parkinson and W. & B. Cowan, Limited, and the Gas-Meter Company, Limited, a model of the Parkinson and Cowan water-balanced governor, the discount meters of the Rotary Meter Company, and in a suite of furnished rooms are other specimens of appliances—prepayment and otherwise—to which reference will be made presently. The result, however, of all this is that the exhibiting firms have had no occasion to repeat these exhibits on their own stands; and so they have been saved the expense of transmitting some of the heavy examples of their manufactures to Caterham. We need not refer to all these types of apparatus; but there is a special stand that the Company have furnished, to which Mr. Helps referred in his speech, and which he privately alluded to on Saturday as his "Chamber of Horrors." There has been an amount of casting around to see how the term applies; and the conclusion has been arrived at that it depends entirely upon who are the inspectors of these particular exhibits. If electrical people, then "Chamber of Horrors" is an apposite description; if gas people, then "Chamber of Delight" is more applicable. For on this stand we have first those ancient and modern gas-burners, illustrating the tremendous advantage given by the incandescent gas-burner compared with the old flat-flame burners; and there are models to scale showing the comparative amount of illumination that can be obtained from electricity, flat-flame burners, and incandescent burners for 1d. This interesting truth is found, that, with electric light as supplied in the Caterham district to slot consumers (at 7d. per unit), for a penny there can be obtained light for the following periods: From the incandescent burner as shown (as supplied to prepayment consumers), 6 hours; from the flat-flame gas-burner as shown (as supplied to prepayment consumers), 5 hours; electric lamp (large) as supplied with slot meters, 2¼ hours; and electric lamp (small) as supplied with slot meters, 4¼ hours. Or, expressed in another way, and having regard to the amount of light given by each form of burner, the cost of a given quantity of light for a given period would be: By incandescent gas-burner, 1d.; by flat-flame gas-burner, 6d.; and by incandescent electric lamp, 10d. The accuracy of the figures as to electric light can be vouched for, as they have been furnished by consumers in the district who have obtained them from the average of actual tests made by them. The stand also contains models showing the quantities of gas sold by the Croydon Company in various years from 1874 to 1904, models illustrating the comparative capacity of the Company's gasholders at various periods, and the comparative amounts of gas obtainable for 1s. in various years in Croydon, also the quantities obtainable in Caterham before the amalgamation with the Croydon Company and now. In the neatly-printed catalogue the Company also give useful information in regard to indoor lighting, and gas for motive power. In regard to motive power, it is not often that an actual comparison of cost with electricity can be made under identical conditions; but the Company have one from a tradesman in the London Road, Croydon. We appropriate this example. In September of last year, the machines of this tradesman were driven by an electric motor; but finding the cost of electric current a heavy expense, he tried the experiment of substituting a gas-engine, with the following result. (The quantities in each case are those charged to, and paid for by, him.)

Cost of Gas	*Cost of Electricity*
For 102 days from Oct. 3, 1904, to Jan. 13, 1905,	For 85 days from June 1 to Sept. 14, 1904,
27,400 cub. ft. at 2s. 5d. . £3 6 3	792 units at 2½d. . . . £8 5 0

Average cost per day: Gas, 7⅝d.; Electricity, 1s. 11½d.

This tradesman thus gets motive power by using gas at one-third the previous cost for electricity. The machines were used to practically the same extent, and for the same hours during each period; the only difference being that while the electric motor was worked to its full capacity the gas-engine had power in reserve sufficient to have driven more machines had that been necessary. The Croydon Gas Company, by the way, allow to users of gas for motive power a rebate of 3d. per 1000 cubic feet (from accounts at the rate of not less than 7500 cubic feet per quarter). Information on cooking and heating is also included in the catalogue.

The General Exhibits.

We can only cursorily draw attention to the general exhibits. In approaching the hall, there can be at a distance no mistaking its location; for the Welsbach Incandescent Gaslight Company have made the exterior of the building brilliant by the aid of three 1200-candle power self-intensifying incandescent gas-lamps. This advertisement is a good one both for the exhibition and the power of gas in illumination. This attraction to the building brings the visitor to the open door; and from there it is remarked that the Welsbach Company have also furnished excellent general lighting for the interior by the application of six 600-candle power self-intensifying indoor lamps. Added the lighting from the stands, the spectacle is one that cannot fail to give general pleasure, with a few nameless exceptions. On the way to Stand No. 1, it is observed that the Company have filled up vacant spaces on the walls with photographs of their works. Space, of course, forbids any attempt at gigantic display on the part of any of the exhibitors; and we are not sure that there is not advantage in their equal limitation, as it is impossible to put more than a certain quantity of goods in a definite area, and so we get a collection of samples the features of which

are quickly explained and comprehended by the visitor. The exhibitors have all done well in the space at their disposal.

On Stand No. 1 are found the goods of Messrs. Wilsons and Mathiesons, Limited. Prominent among their exhibits, a noticeable feature is the "Lustre" condenser. In front at the base we have what is to all intents and purposes the old reflector fire, but above are arched tubes, after the manner of the ordinary condenser, but the descending back tubes are carried right down to the base of the stove; and the products of combustion condense there into an under tray. Also, the "Shereton" fire is a production to be admired, if only for its finish.

Messrs. John Wright and Co. have examples of many of their well-known goods on view, chief among them being their gas-heated self-contained steam-radiators. The business in radiators appears to be a flourishing one; and at all the stove stands, one finds them, and hears of the demand this season being "strong."

The Davis Gas-Stove Company, Limited, call special attention to their "Trident" fires; and among other things to their radiators.

A central feature on the Imperial Stove Company's stand is the patent "Cyclone" water-heater attachment for gas-cookers. This Company have also a handsome condensing gas-radiator.

The well-known name of "Acme" naturally imposes itself on attention at Messrs. Arden Hill and Co.'s stand. Gas-heated steam-radiators face the visitor. Here we have the "Mars," about which the automatic regulation of the gas is referred to as an exceptionally good feature.

At the stand of Messrs. Fletcher, Russell, and Co., Limited, is obtained a fairly good survey of the range of their gas fires and cookers and appliances for industrial use. The "Floral" radiator always attracts notice.

The same may be written of the Richmond Gas Stove and Meter Company's stand. Of course, the exhibit would not be complete just now without the "Monarch" gas-steam radiator, nor without the "Ilford" fire, which the consumer himself can overhaul and clean by the release of a couple of screws.

Turning to the lighting section, Messrs. Hayward and Co. first claim attention for an excellent display of the various types of their "Humphrey" lamp, flash-signs, water-heaters, toasters, &c.

Mr. William Edgar's stand reminds us forcibly of the display he made at Earl's Court. But the late additions to his productions will be found worth inspection. There is, for instance, the "Imperial" lamp of 1000-candle power, fitted with six burners. The burners are solid and plain. But it is the head that requires examination, as the high duty of the burners depends largely upon the exact angle at which the holes are cut in the head, which angle effects the direction of the flame on to the mantle. The parts are made interchangeable for replacements. Another special feature is the inverted burner with almost completely hidden bye-pass tube, and tap quite out of the way of the heat from the burner, above which it is also noticed there is a minimum of metal work.

The Welsbach Company make an excellent display of their self-intensifying lamps, pendants, Welsbach-Kern radiators, incandescent burners, mantles, and fittings generally, including a church corona, with inverted burners.

At Messrs. George Bray and Co.'s stand, there is much to attract notice. Their incandescent burner should be examined. It has a large range of utility. It is noticed that the gas-nipple has seven holes, and that the central ones can be closed or opened by means of a simple screw gas-adjuster. This enables the burner to be used with any quality of gas, or at any pressure up to 40-10ths. The porcelain head of these burners is a beautiful piece of work. The firm's reversible incandescent burner, with spring band for holding the globe, is noticed; and a church corona shows how, by the incandescent system, congregations may be brought from the gloom of the old flat-flame burner to perfect light, at a small expense.

There is a large collection of goods to be seen at Messrs. William Sugg and Co.'s stand; but attention gets centralized on a small hot-air plant that is compressing gas for one three-burner 1000-candle power lamp, and two two-burner 700-candle power ones. This little engine, however (which only uses 6 cubic feet of gas per hour for heating), is capable of supplying lamps with high-pressure gas containing altogether nine burners. To the lamps exhibited, the gas is being supplied at a pressure of 12 inches. Owners of billiard tables ought to see the billiard incandescent gas-lights here, with anti-vibration burners. The stage in the hall is lighted by the firm with four "Berwick" lamps, giving a total illuminating power of 400 candles, with a consumption per lamp of 4 cubic feet. This is to illustrate soft and well-diffused lighting for interiors.

The New Inverted Lamp Company, Limited, make an exceedingly pretty display with their inverted burners, both of the large and bijou patterns, fitted (singly and in clusters) to tasteful pendants and brackets, with and without silk shades. The "Hanwell" pendants are also on view here.

A good demonstration is being made by the Pneumatic Distance Gas Lighter. The verdict of users is that this lighter works well; and the exhibit confirms it. It is a simple apparatus, consisting of three parts: The first is a patent valve piece, which screws on to any ordinary gas bracket, pendant, or chandelier; the second is a 24 feet length (or longer if required) of very fine tubing, either brass, copper, or cotton covered (very closely resembling electric wire); and the third is the push or switch. That is all; and by its use such convenience as is attributable to the electric light in the matter of lighting up and extinguishing is obtained.

The last exhibit to be inspected is a suite of rooms, furnished by Mr. A. C. Ebbutt, of Croydon. The model drawing-room shows how it should be ighted and heated. It illustrates the decorative effect to be produced by the inverted gas-burner; and a tiled recess fitted with a pretty gas-fire and overmantel by Messrs. Wilsons and Mathiesons indicates how it should be heated.

The model bath-room is fitted up by Messrs. Ewart and Son, Limited; and explanation is to be obtained here as to how hot water can be secured throughout a house, at a modest consumption of gas—the act of turning on and off the water raising and lowering the flames beneath a geyser, no matter where the geyser is situated. The firm have now extended the utility of their small "Lightning" geyser by providing for the supply of hot water from it to both a bath and a lavatory basin. This is demonstrated by the exhibit.

A model kitchen and parlour illustrate what the Croydon Gas Company are doing for their prepayment consumers, and their inspection ought to make a prompt run on this department of the Company's work.

Mr. Helps believes in extra attractions for exhibitions; and each afternoon and evening a programme of music is performed by the Anglo-Viennese Band, a tea room has been provided, and, last but not least, Miss Edith Sanderson is lecturing on, and demonstrating, in her usual attractive style, the merits of the gas-cooker.

GAS AND ELECTRICITY SUPPLY IN NEW YORK.

The Powers of the New Commission.

In the "JOURNAL" for the 17th ult. (p. 185), it was mentioned, in the course of an article dealing with Gas Affairs in New York City—mainly in connection with the effect of the new legislation in regard to the pressure of gas which came into force on the 1st of July—that the Commission who were appointed as the outcome of the Stevens investigation had entered upon their duties. These, as defined by the Act constituting the Commission, which became law on the 3rd of June, are "to regulate the price of gas and electric light, and certain other electric services, and to provide for the control and supervision of gas, electric light, and other electric corporations." The Act contains 23 sections, of which the following is an epitome.

Sections 1 and 2 formally constitute the Commission and explain the scope of certain terms used in the Act.

Sections 3 and 4 deal with the composition of the Commission. It sets forth that it is to consist of three Commissioners to be appointed by the Governor, by, and with the advice and consent of, the Senate, one of whom shall be designated by the Governor as Chairman. Of the first Commissioners, one is to be appointed for a term of two years, one for four years, and one for six years, from June 1, 1905. On the expiration of these terms, the term of office as Commissioners thereafter appointed shall be six years, beginning on the 1st day of June in the year in which they are appointed. Each Commissioner is to hold office until his successor shall have been appointed and shall have qualified. If a vacancy occurs otherwise than by expiration of term, the Governor is to appoint a Commissioner to fill it for the unexpired term. Each Commissioner, and each person appointed to office by the Commission, shall, before entering upon the duties of his office, take and subscribe the constitutional oath of office. No person shall be eligible to appointment or hold the office of Commissioner, or be appointed by the Commission to, or hold any office or position under, it, who holds any official relation to any gas or electric light or power corporation, or who owns stock or bonds therein.

The next four sections bear upon the meetings of the Commission, their salaries, and their staff. The principal office is to be in Albany, but the Commission may have a branch office in New York and another in Buffalo. The Commission are to meet at least once a month during the year at the office in Albany; and they are to have an official seal, to be prepared by the Secretary of State. Two of the Commissioners are to constitute a quorum for the transaction of any business or the performance of any duty; and they may hold meetings at any time or place within the State. All examinations or investigations made by the Commission may be held and taken by and before any one of the Commissioners; and the proceedings and decisions of such Commissioner are to be deemed the proceedings and decisions of the Commission, when approved and confirmed by the full body. The Commission may appoint such officers, clerks, inspectors, experts, and employees as may be required to carry out the provisions of the Act, and may prescribe their duties. The annual salary of each Commissioner is to be $8000. The officers, clerks, &c., are to receive the compensation fixed by the Commission. In the discharge of their official duties, the Commissioners are to have repaid to them the necessary travelling expenses and disbursements of themselves and their officers and other employees, not exceeding in the aggregate $500 per month.

In section 9, the general powers of the Commission are set out as follows:—

1.—The Commission shall have the general supervision of all persons and corporations having authority, under any general or special law, to lay down or erect and maintain wires, pipes, and other fixtures in, over, or under, the streets, highways, and public places of any municipality in this State, for the purpose of furnishing gas or of furnishing or transmitting electricity for light, heat, or power.

2.—Investigate and ascertain from time to time the quality of gas supplied by persons, corporations, or municipalities; examine the methods employed by such persons, corporations, or municipalities in supplying gas and electricity for light, heat, and power, or in transmitting the same, and order such improvements as will best promote public interests, preserve the public health, and protect those using such gas or electricity, and those employed in the manufacture and distribution thereof, or in the maintenance or operation of the works, wires, poles, lines, and systems connected therewith.

3.—Fix the standard of illuminating power and purity of gas manufactured and sold by persons, corporations, and municipalities for lighting purposes, not less than that prescribed by law, and require the gas so manufactured and sold to equal the standard established by law or by it, and establish a standard of pressure at which gas shall be delivered, where such standard is not otherwise prescribed by law.

4.—Have power, in its discretion, to prescribe methods of keeping accounts and books, to be observed by the persons, corporations, and municipalities engaged in the manufacture, sale, and distribution of gas and electricity for light, heat, or power.

5.—Examine all persons, corporations, and municipalities under its supervision; keep informed as to the methods employed by them in the transaction of their business; and see that their property is maintained and operated for the security and accommodation of the public, and in compliance with the provisions of law and of their franchises and charters.

6.—Require each corporation under its supervision to submit to it an annual report, verified by the oath of the President, Treasurer, or General

Manager thereof, showing in detail (1) the amount of its authorized capital stock, and the amount issued and outstanding; (2) the amount of its authorized bonded indebtedness, and the amount of its bonds issued and outstanding; (3) its receipts and expenditures during the preceding year; (4) the amount paid as dividends upon its stock and as interest upon its bonds; (5) the amount paid as salaries to its officers and as wages to its employees; (6) the location of its plant and system, with a full description of its property and franchises; and (7) such other facts pertaining to the operation and maintenance of the plant and system, and to the affairs of such corporation, as may be required by the Commission. Such reports shall be in the form, cover the period, and be submitted at the time prescribed by the Commission.

7.—Make to the Legislature an annual report containing the result (1) of examinations or investigations conducted by it, and abstracts of reports of corporations made to it; (2) recommendations as to modifications of the laws pertaining to the affairs of corporations subject to its supervision; (3) such facts and explanations as will disclose the methods employed in the manufacture, sale, and distribution of gas and electricity for light, heat, and power; (4) suggestions as to the better protection of public interests and health in the transaction of business by such corporations; and (5) a record of the meetings and an abstract of the proceedings of the Commission during the preceding year.

8.—Have power, either through its members, inspectors, or employees duly authorized by it, to enter in or upon the property, buildings, plants, factories, power-houses, and offices of any of such corporations, persons, or municipalities, while the same are open for the purpose of operation, or while the business of such corporations is being done therein.

9.—Have power to examine the books and affairs of any such corporations, persons, or municipalities, and to compel the production before it of books and papers pertaining to the affairs being investigated by it.

10.—Have power to subpœna witnesses, take testimony, and administer oaths to witnesses in any proceeding or examination instituted before it, or conducted by it under the provisions of this Act.

11.—Have power to adopt rules governing practice in proceedings brought by or before it not inconsistent with law.

Section 10 gives the Commission full power, control, and supervision of the inspection of gas and electric meters by any State or municipal officer appointed for such purpose; and they may adopt and enforce rules and regulations, not inconsistent with the law, prescribing the manner, methods, and conditions of such testing. They are to see that the State Inspector of Gas-Meters, and the inspectors appointed by him, as well as municipal inspectors of gas and electric meters, faithfully perform the duties imposed upon them by law and by the rules and regulations of the Commission. They are to report any failure of such performance, or any violation of the law or of the rules or regulations, to the officer or board appointing the inspectors; and the failure or violation is to be a sufficient cause for their removal. The Commission may provide for the inspection of electric meters, and may appoint officers for the purpose.

According to section 11, any body incorporated, under the laws of New York or any other State, for the manufacture and supply of gas or electricity for public or private lighting, heating, or motive force, are not to exercise any of their powers or transact any business within the State until they have secured a certificate of authority signed and executed by the Commission. No municipality are to build, maintain, and operate, for other than municipal purposes, any works or systems for the manufacture and supply of gas or electricity for lighting purposes, without a certificate of authority granted by the Commission. If the certificate is refused, no further proceedings are to be taken before the Commission; but a fresh application may be made after a year from the date of the refusal.

Under the next two sections, no corporation subject to the supervision of the Commission are to issue stocks or bonds without having first obtained a certificate of authority; and even then they must not exceed the amount sanctioned. Nor must they transfer or lease their franchise, works, system, or property, or any part of it, without the written consent of the Commission. One authority must not acquire stock or bonds of another in the same business unless authorized to do so by the Commission. Appeal from the decisions of the Commission is allowed to the Appellate Division of the Supreme Court of the Third Department, if within 60 days the parties aggrieved take the necessary steps to prosecute it. The Court may order the Commission to issue the certificate or grant the authority or consent applied for.

Sections 15 and 16 deal with complaints made to the Commission in regard to the quality and price of gas and electricity. They set forth that upon the complaint in writing of the Mayor of a city, the Trustees of a village, or the Town Board of a town in which a person or corporation is authorized to manufacture, sell, or supply gas or electricity for heat, light, or power, or upon the complaint in writing of not less than 100 customers or purchasers of such gas or electricity, as to the illuminating power, purity, pressure, or price of the gas or electricity sold and delivered in such municipality, the Commission are to investigate the cause of the complaint; and they may, by their agents and officers, inspect the works, system, plant, and methods used in manufacturing, transmitting, and supplying the gas or electricity, and examine, or cause to be examined, the books and papers pertaining thereto. The forms of complaint are to be signed by the officers, or by the customers, purchasers, or subscribers making them, who must attach their addresses.

The next four sections relate to the hearing of the complaints. Before opening any inquiry, the Commission are to give notice to the corporation concerned, who may be represented by counsel. At its conclusion, the Commission may fix the maximum price to be charged for gas or electricity, or may order such improvement in the methods of manufacture or supply as will, in their judgment, improve the service. The new price is to remain in force for three years, after which the Commission are, upon complaint, to again fix the maximum. In this case also appeal is allowed to the Supreme Court; but it must be made within 30 days from the date of the Commissioners' order. The Court may affirm, reverse in whole or in part, or modify the order appealed from. An order made by the Commission or by the Court may be enforced by writ of *mandamus*.

The remaining sections provide that, in the event of a charge being

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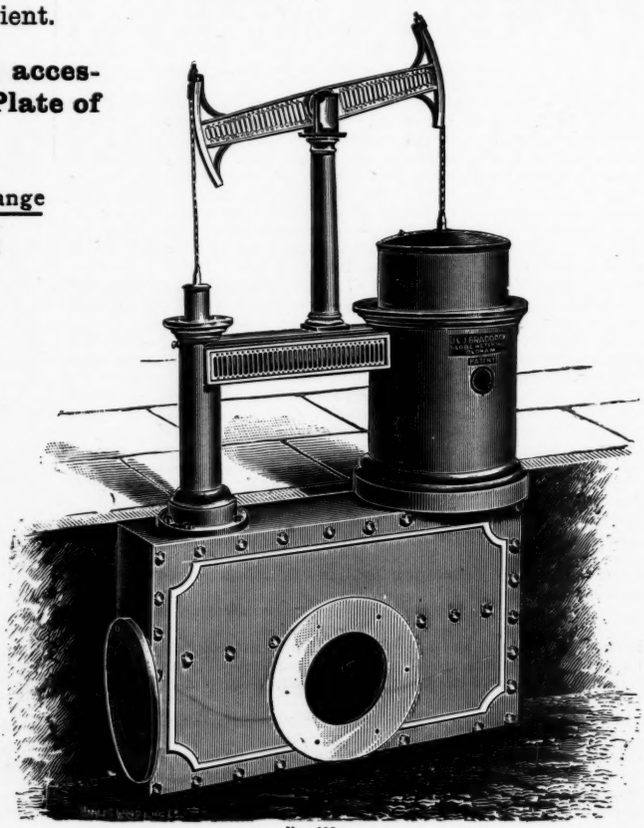

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made for gas or electricity in excess of that fixed by the Commission or by statute, it shall not be recoverable from the consumer, who, in the excessive charge, will have a complete defence to any action brought against him. It is also specified that there is to be appropriated for the use of the Commission the sum of $60,000.

LOUGHBOROUGH WATER SUPPLY.

Progress of the New Works.

In the "JOURNAL" last week, reference was made to the inconvenience experienced at Loughborough owing to the scarcity of water, and to the steps which have been taken by the Corporation to bring their works up to the requirements of the town. The consumption of water has gradually increased until at the commencement of the present year it stood at nearly 750,000 gallons per day, or 170,000 gallons per day more than at the beginning of 1904. The Midland Railway Company have been largely responsible for this remarkable increase, as they have laid down water-troughs between Loughborough and Hathern for the supply of locomotives while drawing trains. The consumption due to this is no less than 100,000 gallons per day; and it is likely to increase, as the Company are altering a number of engines so as to enable them to scoop up water when running at full speed. The Nanpantan works—the first undertaking for the supply of Loughborough with water—were completed in 1866. The population of the town was then only 12,000; and to meet their wants a supply of 300,000 gallons, per day was provided. The principal feature of these works was an impounding reservoir, with a capacity of about 29 million gallons, for storing the waters of the Woodbrook—a stream rising in Charnwood Forest, and having a watershed of about 1050 acres. After a lapse of twenty years, these works were found insufficient; and a Bill was promoted for acquiring the Blackbrook watershed of 3026 acres. The works executed consisted of two intakes and a pipeline about 5½ miles long, of sufficient capacity to convey the water to the existing reservoir at Nanpantan. After a lapse of another twelve years, it became evident that the growth of the population and manufactures rendered it necessary to construct an impounding reservoir; and an Act was obtained with this object in the session of 1899. It was decided to purchase 113 additional acres of land, and to fix the compensation water at 30,000 gallons per day. On the site of the dam forming the impounding reservoir there is a valley 439 feet wide at the top water-line; the hills being 400 feet high on either side. At a distance of 350 yards back from the dam, the reservoir widens out to half-a-mile; the extreme length being within a few yards of a mile. The reservoir will accordingly have a capacity of 506 million gallons; the water area being 84½ acres. By this means the new works will afford a supply of 2 million gallons per day. The price named in the contract let for the construction of the reservoir was £56,707; but the Corporation have had to take the works into their own hands, and about £40,000 is required to complete the scheme; so that the total cost of the reservoir will be £100,000 in round figures. The Contractors for the work are Messrs. G. & F. W. Hodson; and Mr. C. E. Robinson is the Resident Engineer. It is hoped that in the course of a few weeks the storage of water will commence to a depth of 25 feet; and this will hold in reserve 32 million gallons.

The Supply of Electrical Energy in London.

At the Meeting of the London County Council on Tuesday, the report of the Highways Committee on the supply of electrical energy (see *ante.*, p. 328) and that of the Finance Committee on the project as noticed last week, came up for consideration. Captain Hemphill, on behalf of the first-named Committee, moved the adoption of the report and the recommendation with which it closed, to the effect that the Council should promote a Bill next session for the above-named object. Mr. Percy Harris moved, as an amendment, that the recommendation be referred back to the Committee, "with an instruction to the Committee that the Council are unwilling to promote a Bill relative to the supply of electrical energy in London which is not based upon any definite scheme, or upon any agreement with the Borough Councils or existing Companies, or upon any estimates which would enable the Council to judge of the financial responsibilities to be incurred by the ratepayers; and, further, that it be an instruction to the Committee to consider the whole matter, and in particular to report whether, in view of the heavy commitments of the Council, and the speculative nature of the proposed enterprise, the Council's efforts should not be directed to securing the supply of electrical energy by new or existing undertakers, on terms and conditions which would safeguard the public interests." After considerable discussion, the amendment was lost by 79 votes to 36. Sir Francis Mowatt moved a further amendment, to add the following words to the main resolution: "Provided that, before the introduction into Parliament of any Bill, opportunity shall be afforded for a full discussion in the Council of its provisions, especially as they affect the financial consequences of the scheme. Mr. M'Kinnon Wood seconded this amendment, which was carried on a division; 79 voting for, and 32 against it.

We have received from Messrs. H. W. Sambridge and Son, of Birmingham and London, their latest catalogue of gas-fittings. It contains an excellent assortment of new designs for inverted and ordinary burners, in both cast and hammered work. There are several novelties in the "Bijou" class, as well as in hall lanterns fitted with the new "Cloisonne" glass; and also brackets in great variety.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

As will be seen upon another page, the leading Corporations in Scotland are to take joint action in their resistance to the proposed regulations dealing with the use of locomotives upon private railway sidings. There has not been much time since Mr. Herring took the matter up to consider as to concerted action, yet the Corporations who were represented at the conference unanimously and cordially agreed to unite for the purpose of averting a common infliction, for it is nothing else. Anyone who is interested and who may stand out of the present movement is not acting a generous part towards the industry at large. This remark applies with especial force to gas managers in England, who appear to be taking no interest in this matter, notwithstanding that it concerns them greatly.

One of those things which would be better left undone has taken place in connection with the municipal election at Hamilton. An elector wrote asking Provost Keith something about the profits at the Corporation Gas-Works at Hamilton; and the Provost, in reply, speaking at a meeting of electors, said something which has brought Mr. W. Ewing, of Greenock, formerly of Hamilton, into the field. Mr. Ewing, in a letter to the "Hamilton Advertiser" of last Saturday, complains that Provost Keith's statements were "grossly inaccurate and misleading," and were made "evidently with the object of damaging his reputation and enhancing that of his successor." Mr. Ewing's letter is a long one, and enters into details which, I think, are not of general interest; but it is significant that immediately below his letter there is one published by the author of the original letter, in which he points out that the price of gas was raised from 2s. 1d to 2s. 6d. per 1000 cubic feet after Mr. Ewing left Hamilton, and that therefore there was not an equal basis of comparison as to profits. Provost Keith replies in to-day's "Hamilton Advertiser" that his statements were correct. Everyone who knows the situation would discount the Provost's statement, which, considering again that it was an electioneering statement, might have been passed by as not worthy of notice. In such matters, comparisons are more than usually odious.

Provost Brown reported to the Lanark Town Council this week that the Special Committee on the proposed purchase of the gas-works recommended that an expert be engaged to go over the works, and that a special meeting of the Council be held next year to consider his report. This was agreed to.

The proposed transfer of the Grangemouth Gas Company's undertaking to the Corporation was before the Town Council on Monday. It was reported that letters had been received from the Agent for the Gas Company, and from Mr. M'Gilchrist and Mr. Silverthorne, and that the Town Clerk had, upon instruction, written to the Company suggesting that, to save useless expense, neither party should proceed to Parliament this winter, pending the regular procedure laid down in the Burghs Gas Supply (Scotland) Act, 1876, and stating that the Committee were unanimous in recommending this course to the Town Council. At a subsequent meeting of the Committee, a letter from the Agent for the Gas Company was read, in which it was stated that, on the distinct understanding that the arbitration under the 1876 Act will be on a compulsory sale basis, the Directors of the Company agreed that their application for statutory powers should not be proceeded with during the ensuing session of Parliament. This has been agreed to.

Mr. D. Smith, who has been for many years a member of the Dunbar Town Council, and Convener of the Gas Committee—being, in fact, described as the oldest Gas Convener in Scotland—was, at the end of last week, unanimously elected Provost of the burgh.

Recently there has been an outbreak of typhoid fever in Dunbar, which has led to inquiries, on behalf of the Local Government Board, into the water supply and other questions. The report which has been received by the Council from the Local Government Board is to the effect that the water in a compensation pond is contaminated by sewage from a community numbering 170; and that such water had been practically turned on every year for some years past, to augment the supply of water to the town in the summer time. The Council gave instructions to have the polluted water effectually cut off. Upon the question of employing an engineer, a long discussion took place; and in the end it was resolved, by eight votes to three, to employ, not a water engineer, but a water diviner, to search for water.

A week ago, at a meeting of the Edinburgh and District Water Trust, Sir Andrew M'Donald called attention to the number of letters which had been received complaining of the quality of the water which was being distributed in the city and district. The Engineer—Mr. W. A. Tait—had informed the Works Committee that the complaints had arisen, not on account of the Talla water being supplied, but owing to the protracted drought and the waters in the Moorfoot and South Pentlands reservoirs being in a very low state, and much more liable to be disturbed by the action of the wind. The present filters in use could not overtake the filtration of the water thus disturbed; and, in these circumstances, he had been supplying a quantity of Talla water unfiltered, as it was better than the filtered water from the other reservoirs. The meeting then proceeded to consider proposals for the laying of mains to convey Talla water to various places where there are already filters in existence; and Mr. Tait was instructed to report to them on the subject.

On the motion of the Chairman (Mr. Joseph Smith, J.P.), the Braintree Rural District Council have decided to empower the Bocking Parish Council to spend a sum not exceeding £300 on trial borings for water. A scheme has been prepared to supply the town and the outlying portions of the parish with water at a cost of £4500. It was stated that the scarcity in the parish was so acute, through wells having dried up, that the poorer people went about with pails begging for water.

REPLY TO SOUTHERN DISTRICT GAS MANAGERS' ASSOCIATION MEETING.

Clapham Bros., Ltd.,

were the first inventors of a system of

RAPID AUTOMATIC FASTENERS

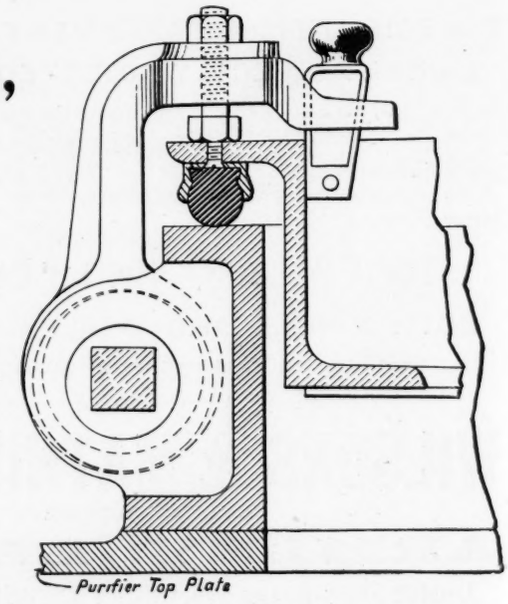
FOR

DRY-LUTE PURIFIERS,

as per illustration, which gives entire satisfaction.

QUOTATION—

"The only drawback to the use of Green's Type of Purifier has been the increased time taken, and consequent increased cost of labour, in removing the number of bolts required to secure the small covers in position, and **this has been completely overcome by an ingenious invention of Messrs. Clapham Brothers, of Keighley."**



Purifier Top Plate

CURRENT SALES OF GAS PRODUCTS.

Week ending Nov. 18.

There has been little change in the London district in tar products during the week. Things have been just a little quiet, but prices have not been affected. Pitch is still from 36s. to 36s. 6d. per ton net; and makers are very well sold. A considerable business has been done in 90 per cent. benzol at 10½d. per gallon net, and very satisfactory forward sales have been made; while 95-160° best solvent has been done at 1s. 3d. net. For prompt, the position of 60° crude carbolic has not been altered. Sulphate of ammonia remains somewhat quiet; but there is a good deal of inquiry both for prompt and for some months ahead. The nominal price on Beckton terms is still £12 17s. 6d. per ton.

LIVERPOOL, *Nov.* 18.

Sulphate of Ammonia.

There has been no arrest of the downward movement, current production, outside the large London and Scotch makes, being rather pressed upon the market; while buyers who have November contracts to cover are taking their time about the operation. There has been some re-selling, but that has not been a prominent feature. The main point has been the scarcity of direct orders. The closing spot prices are £12 7s. 6d. per ton f.o.b. Hull, £12 10s. per ton f.o.b. Liverpool, and £12 12s. 6d. per ton f.o.b. Leith. The large London and Scotch makes being already fairly well sold up to and over the spring months, makers are disinclined to follow a drooping market; while elsewhere, makers' views are for the most part too high to permit of business. So that orders for spring months have either been taken speculatively, or placed with Continental makers at about the level of current spot prices.

Nitrate of Soda.

This article is very quiet on spot, though prices remain nominally 10s. 9d. to 11s. per cwt.

LONDON, *Nov.* 18.

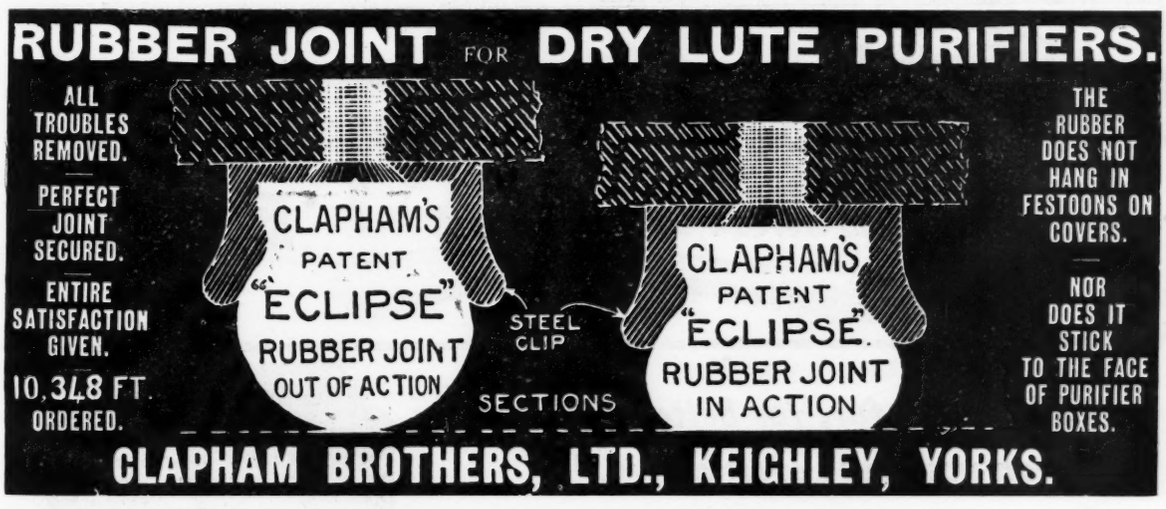
Tar Products.

Business has been rather quiet during the past week, and there has certainly not been quite so much inquiry all round. In 90 per cent. benzol, business in London is reported at 10d. for November-December; while a considerable quantity was placed in the North at about the equivalent of this price for January-June delivery. There is a fairly good demand for 50-90 per cent.; but there is no business to report, as manufacturers are asking higher prices than buyers are willing to pay. In toluol, the position remains unchanged, and there is really nothing offering for early delivery; while for next year makers do not quote under 1s. per gallon. Solvent naphtha continues in good demand, and there is very little offering for early delivery, although there is certainly rather more desire on the part of manufacturers to sell for all next year. Some small parcels of 95 per cent. at 160° are reported to have been placed at very good prices for home consumption; while the request for high-flash makes with a heavy gravity is very strong, both for prompt and forward delivery. The demand for carbolic acid continues good; but consumers decline to pay more than 1s. 9d. for prompt or forward delivery, which does not tempt makers to sell, as they appear to believe in higher prices for next year, and in many instances ask 1s. 10d. for January-June. In crystals, there is nothing fresh to advise, and there does not appear to have been anything of importance doing during the past week. The market for creosote remains firm; and there is really no change in prices. The principal demand is still from America, and for November-December delivery. It is reported from Yorkshire that one or two small contracts have been placed at 1⅜d. per gallon; while in the Lancashire district there is certainly a fair quantity offering for early delivery. There is no business of importance to report in pitch, and the market remains in practically the same position. So far as London is concerned, makers still ask 35s. to 35s. 6d., which prices do not tempt consumers to contract. In Yorkshire, it is reported that business has been done at Hull at over 35s.; but there are certainly sellers at 35s. 6d. for January-June. Consumers, however, as a rule are not inclined to pay more than 35s. over this period, and even at this price business would be only limited. Tar distillers in the Manchester district report an improvement in value for November-December shipment, over which period they state a considerable quantity has been placed. There are still rumours of a strike in Germany, which, of course, may have an important effect on the market for pitch. The demand still continues good in South Wales, and several contracts are now in course of negotiation for January-June delivery.

The average values during the week were: Tar, 18s. to 22s. 6d. Pitch, London, 35s. to 35s. 6d.; east coast, 34s. 6d. to 35s.; west coast, 32s. to 34s. Benzol, 90 per cent., 10d.; 50-90 per cent., 10¼d. to 10½d. Toluol, 11d. to 11½d. Crude naphtha, 3⅜d. to 4d.; solvent naphtha, 10¼d. to 11d.; heavy naphtha, 11d. to 11½d. Creosote, London, 1⅞d. to 2d.; North, 1⅝d. to 1¾d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 1s. 9d. to 1s. 9½d. Refined naphthalene, £4 10s. to £8; salts, 15s. to 17s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market is quiet, and prices are easier all round. Beckton still quote £12 17s. 6d.; but there is no business possible at this price, as buyers are not prepared to pay more than £12 15s. for November-December. The South Metropolitan Company now quote £12 16s. 3d. on their own special terms; but even this figure is rather above buyers' ideas. In Hull, there is no business to report. There are still buyers at £12 10s. for November-December; but manufacturers do not seem inclined to accept this price. With regard to Leith, the market is quiet; and it is reported that business has been done at £12 15s. for November-December. In Liverpool, there is very little doing, and the market is unchanged; but prices have certainly rather a downward tendency.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ALL TROUBLES REMOVED.
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THE RUBBER DOES NOT HANG IN FESTOONS ON COVERS.
NOR DOES IT STICK TO THE FACE OF PURIFIER BOXES.
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ADVANTAGES.

1st.—The shape of "**The New Century Cover**" gives rigidity and protection to the rubber when covers are removed, also reduces the waste gas space in opening.

2nd.—The great difficulty of making a satisfactory rubber joint is removed; the section of the "**Eclipse**" giving the required elasticity to overcome these difficulties.

3rd.—The difficulty and trouble of making two foreign substances adhere to each other is removed by the **Steel Clip,** which thoroughly secures the rubber to the cover.

4th.—The primitive method of securing the covers by means of nuts which were to unscrew and tighten down every time the covers were removed is obviated. One operation by means of a spanner placed on the square shaft at any point nearest the operator, undoing or fastening the series of bolts, consequently uniformity of pressure and great saving of labour. It is computed that the whole of the fasteners will be secured in one-eighth the time taken under the old system.

5th.—No freezing of lutes through exposure to frost.

COAL TRADE REPORTS.

Lancashire Coal Trade.

There is little change to report in the coal trade of Lancashire. House coal has not yet been demanded to the extent that coalowners had expected; but the cold and frosty weather of the past week has improved matters somewhat, and prices are stiffer for the better qualities. Engine fuel is in good demand, with every prospect of continuance. The Pemberton colliers' strike is still unsettled. Those who would work are prevented from so doing by the strikers, and magisterial proceedings have been commenced against several of the men for interfering with so-called "knobsticks." Quotations at the pit mouth are: Best house coal 13s. 6d. to 14s. 6d., secondary 12s. to 13s., common 9s. to 10s., steam and forge 8s. to 9s., best engine fuel 7s. 6d. to 8s. 6d., slack 7s. to 8s., medium 6s. 6d. to 7s. 6d., washed slack 7s. 6d. to 8s. 6d., common sorts 5s. to 6s., and coal for shipping 9s. 6d. to 10s. 6d. The demand for cannel, both on existing and new contracts, is increasing.

Northern Coal Trade.

There is a moderate demand only for steam coals; and the pits have not full time generally—the trade having to some extent been deranged by the non-arrival of steamers through the stormy weather. Steam coal has felt the effect most, for it is at the time which is usually dull for this class of fuel. Best Northumbrian steams are from 8s. 7½d. to 8s. 9d. per ton f.o.b., second-class steams are 8s. 3d., and steam smalls are relatively firm at from 4s. 10d. to 5s. 6d. There is not much change in other than gas coal. Durham gas coals are in very strong demand, so that a full output is readily taken up, except where steamers do not arrive as expected. Prices are firm, especially for best gas kinds—the values ranging, according to quality, from 8s. 3d. to 9s. 3d. per ton f.o.b. At the same time, with these firm prices, there is some heed given to the fact that the international competition is increasing—as shown by the allotment of part of the Neapolitan gas contract to German coals, owing to their tenders being lower than those of the Durham pits, who have long had the contract. Such facts will check the attempt to force up prices for foreign contracts. In the coke trade, prices are firm; but gas coke is dull—the exports being less, and the production heavy, though there is occasionally a larger use of coke at the gas-works. Prices are irregular, and much as we last quoted them.

Scotch Coal Trade.

There is great activity in the market, with higher prices in prospect, if not actually realized as yet. Ell for shipment, and splint for home consumption, are in greatest request. The prices quoted are: Main 7s. 6d. to 7s. 9d. per ton f.o.b. Glasgow, ell 8s. 6d. to 9s. 3d., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 240,556 tons—a decrease of 20,385 tons upon the previous week, but an increase of 22,855 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,714,610 tons—an increase of 574,191 tons upon 1904.

Sulphur Testing at Tynemouth.

Since February, 1904, the gas of the Tynemouth Gas Company has been regularly tested for sulphur; the parliamentary limit being fixed at 20 grains per 100 cubic feet. At a meeting of the Electricity Committee of the Tynemouth Corporation on the 24th ult., it was resolved—"That the offer of the Gas Company to reduce price of gas by 1d. per 1000 cubic feet, on condition that the sulphur test is abolished, be accepted on trial for twelve months from Jan. 1 next;" and this was confirmed without comment at the Council meeting on Wednesday last. The saving to the Company is estimated at slightly under ½d. per 1000 cubic feet. The alteration has no effect upon dividends, and simply means that the price of gas is reduced sooner than it could otherwise have been. The price will now be 2s. per 1000 cubic feet, with discounts from 5 to 20 per cent., according to consumption. No higher price is charged for outlying districts, and no lower price is charged for power; but this latter matter is receiving attention.

Cork Water-Works Inquiry.

As the result of breakdowns of the machinery, Cork was on several occasions last summer seriously inconvenienced in the matter of water supply; and owing to the strange nature of the occurrences, it was resolved to ask the Local Government Board to hold an inquiry into the affair. This was done—the witnesses being examined on oath; and the report of the Inspectors (Dr. Browne and Mr. Price) has since been received. There were five distinct cases dealt with. The first referred to a water-pipe, which was found (shortly after it had been laid) to be choked up with earth and sticks, and to have had a hole knocked in it. The next event was the fracturing of the disc of the turbine; while the third and fourth cases had reference to injuries to the horizontal pumping-engine, and the fifth to damage to an engine sent from Dublin to tide the city over the straits caused by the earlier breakdowns. The inquiry extended over three days; and evidence was given with a view of showing that some of the injury at all events had been caused maliciously. The City Engineer (Mr. J. F. Delany), the Resident Engineer (Mr. J. O'Keeffe), and various employees were called and gave evidence. On behalf of Mr. O'Keeffe, it was urged that he had very little power as regarded his subordinates, and that the breaking of the turbine disc (for which it had been suggested he was responsible) was the result of fair wear and tear. For Mr. Delany, it was urged that there had been much ill-feeling ever since his appointment—which included full responsibility for the proper operation of the water-works; Mr. O'Keeffe being subservient to him. The Inspectors recommend the dismissal forthwith of a man named Scannell; and they suggest that Mr. O'Keeffe and two fitters named Cronin and Enright should be asked to send in their resignations. The report has been referred to a special meeting of the Council.

CARRON Gas FIRES

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Teignmouth Water Supply.

An inquiry was held at Teignmouth on Friday, by Mr. H. Percy Boulnois, an Inspector of the Local Government Board, respecting an application by the Urban District Council for power to borrow £21,830 for works of water supply. Mr. Pearce, Solicitor, explained that the Local Authority had been considering the question of water supply for twenty years. Teignmouth and Shaldon had separate supplies, but both were more or less intermittent. The present quantity of good water was only about 9 gallons per head per day, and ought to be at least from 20 to 25 gallons. An agreement had been entered into with the Paignton District Council for a supply of water from the new works which the Council were constructing on Dartmoor. The agreement was for the supply of 600,000 gallons per day in bulk; and, in addition to this, Paignton was to supply 216,000 gallons per day to Brixham. The area of the storage reservoir was 33 acres, and its capacity 190 million gallons, or equal to 133 days' supply both for Paignton and for the districts of Teignmouth and Brixham. It was proposed to make a junction with the Paignton main, and to lay a 9-inch main from that point to the Hazeldown reservoir at Teignmouth. Where the River Teign had to be crossed, the main would be duplicated, and would cross under the bed of the river by means of an inverted syphon. The original intention was to lay down iron pipes, except where the river had to be crossed; but it was now proposed to lay down British Mannesmann weldless steel tubes in their place, which would effect a saving of £2700. Mr. C. F. Gettings explained the scheme in detail, and said the principal question which arose was as to the crossing of the river. The top of the concrete covering of the pipes would be 4 inches below the bed of the river; and he did not think that any material damage would be done if a scour took place. Mr. Tozer, who appeared for the Harbour Commissioners, said that, if the pipes did not suffer, the back of a barge might be broken if it should ground on the ridge of concrete. In order that the navigation of the river might not be interfered with, the Commissioners asked that the pipes should be laid at a reasonable depth. Mr. Pearce said, of course, the District Council had no desire to endanger the navigation, and would lay the pipes 3 feet below the bed of the river. It was eventually agreed that the pipes should be laid at such a depth that the whole of the concrete should not be less in any part than 3 feet below the present bed of the river; and also that if the channel was at any time deepened or widened for the purpose of improving the navigation, the Council would, at their own expense, lower the pipes. The Inspector remarked that, on the face of it, this appeared a very reasonable scheme.

The Bath Markets Committee have been considering a report showing the increased cost of lighting the markets by electricity, as compared with the outlay when gas was used. They have decided to obtain an estimate for the lighting from the Bath Gas Company, and also to ask the Electricity Department of the Corporation if they are able to supply the current at a lower rate than is at present charged.

Ashton and Stalybridge Water Supply.

Last Wednesday, Mr. W. O. E. Meade-King, on behalf of the Local Government Board, held an inquiry at Ashton into an application of the Ashton, Stalybridge, and Dukinfield District Water-Works Joint Committee for the issue of a Provisional Order, under section 303 of the Public Health Act, 1875, to partially repeal or amend the Ashton, Stalybridge, and Dukinfield Water-Works Acts, 1870 to 1892, so as to enable the Committee to acquire by agreement additional lands known as the Ashway Gap Estate, for the construction of a new reservoir at Chew Valley. The Town Clerk (Mr. F. W. Bromley) said that as the Committee had obtained parliamentary powers to execute the works of the Chew reservoir, he took it that the inquiry would be limited to the question of the necessity of acquiring the land. The Committee were about to commence the construction of the reservoir, and had retained as Engineers Messrs. G. H. Hill and Sons, who were the Engineers for the construction of the Yeoman Hey and Greenfield reservoirs. The estate consisted of freehold moorland sporting property of about 2300 acres in extent. The Committee agreed to purchase it for £12,500. Under their Act of 1892, the Committee could hold 100 acres of land; and they wished under the proposed Order to be enabled to hold as much as the acreage of the Ashway Gap Estate. Mr. H. P. Hill, in his evidence, stated that the reservoir was to be used for compensation purposes.

The Penrith Gas Explosion.—The recent gas explosion at Penrith (*ante*, p. 407) seems to have been even more serious in respect to the damage to property than was at first supposed. The various insurance companies concerned put the matter into the hands of Assessors, who have lodged a claim for £4300 against the Urban District Council, as the owners of the gas-works. This amount does not include the claims which will be made for personal injuries; and the sum which Messrs. Arnison (the drapers, whose shop was wrecked) will claim for loss of business is as yet unknown. Their premises are still closed. A few days after the explosion, the Council, it is stated, accepted responsibility for the occurrence, and appointed Assessors on behalf of the town.

Water Supply of Small Country Towns.—In the course of the address delivered by Mr. C. Bidwell, M.A., at the opening meeting of the Surveyors' Institution on Monday last week, he said the water supply of small towns and villages had become an urgent question in the country districts. In his judgment, it was a matter of national importance, and one which must be dealt with without much delay, and he trusted the time was not far distant when we should see either a Central Water Board in London, or the country divided into large areas, each with a representative Water Board empowered to deal with all questions affecting the water supply of its own district—such as the storage of water, the pollution of the rivers and streams, and the abstraction of water from a particular district by large cities situated at a considerable distance from the source of supply. He condemned the present system, or rather want of it, as leading to waste, friction, and public loss and inconvenience.

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CAUSE.

The adoption of **ELECTRIC HEATERS** is mainly due to the fact that their claim is to generate **PURE HEAT.**

EFFECT.

A big bill for Current consumed and maintenance of lamps.

REMEDY.

Supply consumers with **A GAS-STOVE** that **DOES** generate **PURE HEAT,** is strictly economical, and costs little or nothing to maintain.

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"SYPHON" STOVES,

GENERATE PURE HEAT ONLY,

Gives invariable Satisfaction to Consumers, both from efficiency and economy in use.

Manchester and the Chorlton-cum-Hardy Gas Supply.—On the motion of Alderman Southern, the Manchester City Council last Wednesday authorized the inclusion in the Corporation Bill, 1906, of a clause confirming the transfer to the Corporation of the Stretford Gas Company's rights in Chorlton-cum-Hardy. The Alderman explained that the Gas Committee had completed negotiations with the Stretford Gas Company for the transfer to them of a portion of their district which was now in the city of Manchester; and they wanted validity given to the arrangement by the insertion of a clause in the Bill.

Llangollen and the Electric Light.—The Llangollen Urban District Council, having decided upon an extension of the public electric lighting so as to embrace the whole of the urban area, are in somewhat of a difficulty over the sealing of the agreement between themselves and the Electric Light Company which has been drawn up in accordance with the tender accepted. When the agreement was brought forward at a special meeting, some of the members objected to its being sealed unless the Company were prepared to give personal guarantees for the due performance of the work. This seemed to point to there being a doubt as to the Company's ability to carry out the scheme satisfactorily; and further colour was lent to this view by the subsequent protests of other members, that it had not been customary in the past to insist upon such guarantees. Upon a vote being taken, half the members present were unable to participate, as they are either shareholders or Directors of the Company; and the remainder were equally divided. Under these circumstances, the Chairman said he would not exercise his right of giving a casting-vote; and the matter had therefore to be left over to a future meeting.

The Proposed Water Board for Mid-Sussex.—A memorandum has been prepared by Dr. Foulerton, the County Medical Officer of Health, on the subject of the water supply of Mid-Sussex, in view of the possibility of the formation of a Joint Board, which was suggested in the course of a recent Local Government Board inquiry. Dr. Foulerton says that the question of a Mid-Sussex Water Board is one of very great importance, as the area proposed for administration by the Joint Board includes some of the most prosperous and still improving districts of the county—districts which serve as excellent illustrations of the return received for judicious expenditure on sanitary improvement in the way of sewerage works, the provision of hospital accommodation, and general efficiency. But it cannot be said that the future of the water supply is all that could be desired; and he feels sure that it would tend to future economy and security of supply, such as is necessary for the maintenance of the welfare of the districts, if the suggestion of the Local Government Board were carried into effect. The inclusion of the parishes of the Chailey rural district in the administrative area of such a Board as that suggested, appears to him to offer advantages to all concerned. He adds that if any arrangements for co-operation could be arrived at as between the Joint Water Board and the Burgess Hill Water Company, the County Council would have the satisfaction of knowing that complete and permanent security in respect of water supply was guaranteed to a large area of the county.

Portsmouth Water Company.—At the meeting of this Company on Thursday, the Directors will report a balance of £31,707 available for distribution; and out of it they recommend the payment of the full statutory dividends. The balance to be carried forward will be £13,354. During the six months ending Sept. 30, the average quantity of water pumped daily was 8,176,929 gallons; the supply for domestic purposes being about 26·16 gallons per head per day.

The Question of Wayleave for Gas-Mains.—The Langholm Town Council have been engaged in a dispute with the local Gas Company with regard to the charge made for the supply of gas to the public lamps. The Council argue that they are entitled to the same discount as is allowed to other large consumers; but the Company seem reluctant to fall in with this view. In order to bring matters to a head, it was agreed at the last meeting of the Council that, instead of insisting on their demand for the discount, they should charge the Gas Company a sum of £21 yearly for wayleave, and also 3d. per yard for opening the streets. In the course of discussion, it was urged that this method seemed the only alternative to starting a Corporation gas-works.

Chorley Water Supply.—An inquiry has been held by Mr. M. K. North, on behalf of the Local Government Board, into an application by the Chorley Rural District Council to borrow £13,000 for providing a water supply for the western portion of their district, and the execution of works in Heapey and Whittle-le-Woods. It was stated that the district had hitherto been inadequately supplied by wells, and that it was intended to obtain the water from the Thirlmere aqueduct of the Manchester Corporation. No storage reservoir would be required; but the mains would be laid over 26 miles at a depth of 3 feet. The price the Council and Corporation were working on was 8d. per 1000 gallons. Croston wished to be included in the scheme; but unfortunately at the time of the inquiry the parties had not been able to arrange terms.

Public Lighting of Wellingborough.—A special meeting of the Wellingborough Urban District Council is to be held to consider the advisability of accepting the offer of the Electric Light Company to light the centre of the town as far as the present electric lamps extend, and the tender of the Gas Company to light the remainder with incandescent lamps; the Electricity Company to take over the working of the refuse destructor. Meanwhile, the Gas Company have written to the Council complaining that the inclusion of the refuse destructor as part of the lighting contract makes a combination which is unfair to them as large ratepayers. They assert that, if the question of street lighting were dealt with on its merits, they would have no fear of competition. Indeed, they add that their tender is lower than the one originally sent in by their competitors, while the amount of light they offer is greatly in excess. They suggest that the Council should defer their decision on the matter until they have had an opportunity of seeing what sort of lighting the Gas Company offer; and they state their willingness to fit and maintain eight or ten of the existing gas-lamps with incandescent burners for a month or so without charge.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ltd.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

EEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 8,150,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

Youghal Gas Supply.—During the past financial year, the Gas Department of the Youghal District Council realized a substantial profit, after paying interest and meeting all other charges, though the price of gas was reduced by 5d. per 1000 cubic feet at the beginning. Under the supervision of Mr. Robert Young, the Gas Manager, the quantity of coal carbonized was 815 tons, yielding 8,448,000 cubic feet of gas, of which 5,468,000 cubic feet were sold, exclusive of the gas used for the public lamps, &c. Compared with the preceding twelve months, there was a decrease of 18 tons in the coal used, an increase of 105,000 cubic feet in the make of gas, and of 298,500 cubic feet in the quantity sold; the yield per ton being 10,310 cubic feet, compared with 9940 feet before. There was slightly more coke produced; and the number of consumers was increased by 55.

Street Works in Westminster.—The Works Committee of the Westminster City Council reported last Tuesday that they had resolved, subject to the usual sanction, that when approving the execution of works affecting the streets within their jurisdiction by gas companies or any other statutory undertakers, the Council should, unless otherwise specifically determined, impose the following conditions: That three clear days' notice be given to the City Engineer and Surveyor specifying, as far as practicable, the places where, and the date and time when, it is proposed to commence the work; that, in the case of postponement, as long a notice as possible be given as to when the work will be commenced; that pipes be not laid in the roadway at less than 2 feet, and in the footway at less than 9 inches from the surface, except by arrangement; that the covers of boxes be filled in with material similar to that of the surrounding pavement, or other hard, durable, and non-slippery material, to the satisfaction of the City Engineer and Surveyor; and that the work be completed within a specified number of months from the date of the Council's resolution consenting to the works.

Oriental Gas Company, Limited.—The report of the Directors of this Company for the year ended June 30 sets forth that the total revenue earned during the year shows an increase of £4334 over that for the preceding twelve months. Of this sum, £3100 is attributable to gas-rental (which shows an advance of very nearly 5 per cent.), and the balance to the sale of residuals. In addition to the reserve fund, a contingency fund has been created, partly by appropriation from the exchange equalization account, and partly from last year's suspense account. Both funds are now fully invested in first-class marketable securities. Reference is made to the visit of Mr. J. C. Watson, the Engineer and Manager, to England, after more than eight years' residence in Calcutta. While he was here, the Board had various opportunities of discussing with him the affairs of the Company, and of forming opinions as to the prospects and possible future development of the undertaking. The balance of the profit and loss account (after payment of the interim dividend of 3½ per cent. and income-tax), is £21,154, out of which the Directors recommend a dividend of 4½ per cent., free of tax; making a total dividend of 8 per cent. for the year, and leaving a balance of £7654 to be carried forward.

Investment of Corporation Sinking Funds.—The Burslem Town Council, in view of the loss which they recently sustained through having to repay a loan the instalments of which had been invested in Consols at higher prices than were now realizable, wrote to the Local Government Board asking whether they might not vary the investments of their sinking fund instalments. The reply was that they might purchase any of the securities which were eligible for trustee investments. Accordingly, the latest annual instalment of the gas-works sinking fund has been invested in Manchester Corporation stock.

Launceston Gas Company and their Water Supply.—The question between the Launceston Gas Company and the Town Council as to the use by the former of the public water supply without payment being made (which was alluded to in the "JOURNAL" for Oct. 24, p. 253), has now been satisfactorily settled. The Town Clerk reported to the Council that he had received a cheque for £50 from the Company in payment for the water taken, and a request to be informed what the charge would be for a future supply. The latter matter has been referred to the Water Committee. Alderman Pethybridge explained that the Company had no knowledge whatever that they were using town water. When they discovered it, they were anxious to make reparation.

Good Financial Position at Driffield.—Driffield occupies an enviable position, inasmuch as since 1902 there has been a steady reduction in the district rates from 5s. 8d. to 4s. 2d. in the pound. Future prospects also are encouraging, owing in some measure to the financial improvement of the gas undertaking. At one time large sums had to be taken from the rates to meet the repayment of loans and interest on the borrowed purchase money. The profits are, however, sufficient at present for this purpose. There is considerable satisfaction among the members of the District Council at the condition of the gas-works; and it is fully realized that hard work has been forthcoming, on the part of those responsible for the management, to bring affairs to so satisfactory a stage.

Sales of Stocks and Shares.—At the Mart, Tokenhouse Yard, on Tuesday, Mr. Alfred Richards placed, under instructions of Directors, two new issues of gas stock and shares. The first lots consisted of an issue of £10,000 of 3 per cent. perpetual debenture stock of the Wandsworth and Putney Gas Company, which fetched £82 to £82 5s. per £100; and the second, 600 "B" £10 shares in the Grays Gas Company, which were sold at from £10 5s. to £10 8s. 6d. each. The same day, Messrs. Lee, Son, and Coupe sold some £5 shares in the Langley Mill and Heanor Gas Company at from £10 3s. to £10 4s. apiece; the previous day they disposed of 62 fully-paid £5 shares in the Ripley Water, Gas, and Coke Company, at £8 15s. and £8 16s. each. Messrs. Spark sold last Tuesday a few shares of similar nominal value in the Littlehampton Gas Company at £8 10s. and £8 11s. each, and some £10 lots of consolidated stock of the Arundel Gas Company at par and 1s. premium. At a sale last week, Mr. J. C. Towner obtained for five original £10 shares in the Eastbourne Gas Company £32 10s. each; and for some "B" shares of the same nominal value, £26 10s. and £27 apiece.

WILLEY & CO. LIMITED,

RETORT WORK. INCLINES A SPECIALITY.

CONDENSERS, ANNULAR AND HORIZONTAL.

WASHERS, LIVESEY'S PATENT.

PURIFIERS AND VALVES

PICKERING'S PATENT.

STATION METERS AND GOVERNORS

SIMPSON'S PATENT.

GASHOLDERS

ANY SIZE.

SEND US YOUR ENQUIRIES.

WHY OPEN A LOT OF ACCOUNTS WHEN YOU CAN COME TO US FOR EVERYTHING, AND OBTAIN IT AT THE LOWEST PRICES?

Works: LONDON AND EXETER.

Agents for Scotland: D. M. NELSON & CO., 53, WATERLOO STREET, GLASGOW.

Suicide by Inhaling Gas.—Charles Hollings, of Bradford (who was suffering from illness, and when in pain had been heard to express a wish that he was dead) was found dead in bed with a pipe attached to a gas-bracket in his mouth, and the gas full on. At the inquest, a verdict of "Suicide while temporarily insane" was returned.

Gas-Works for Burry Port.—The Burry Port Urban District Council are promoting a Bill in the next session of Parliament for powers to construct gas-works. The area is included in the district of the Llanelly Gaslight Company under their Act; but the Company have not exercised their powers, and have not laid their mains outside the tinplate town. Burry Port has consequently up to the present time had to use oil-lamps. It is understood that the Llanelly Company will offer opposition to the Bill.

Position of the Coal Trade.—Mr. Henry Bramall, the President of the Manchester Geological and Mining Society, in his Inaugural Address to the members a few days ago, deplored the fact that the results of colliery working were, from a financial point of view, far from satisfactory. Besides low prices, colliery proprietors found themselves burdened with increased costs—such as high rates of wages, shorter hours of work, an increase in the burden of local taxation, and the further obligation imposed upon coal-owners by Parliament, in the shape of a tax which he ventured to think no government, which considered it part of its duty to encourage a national industry, would have conceived.

Labour Conditions of Leeds Gas-Workers.—The Leeds gas-workers are, it seems, still considering the question of a six or seven day week. It had been hoped that a meeting of the men might have been arranged for last Sunday; but ultimately it was decided to postpone it for a week. It is expected the men will then have an opportunity of expressing their views in regard to the proposal of the Gas Committee to guarantee a week of six working days instead of seven as at present, and thus provide work for about 100 additional men. While anxious, like the Committee, to see more men at work, those already engaged are naturally concerned about the reduction in their weekly earnings which the proposed change would bring about.

A Fatal Gas Escape.—Seaforth, near Liverpool, was on Saturday the scene of a sad affair, which involved the loss of two lives. Recently some relatives went to stay at the house of an aged widow named Stringer, in order to look after her. These relatives—Mr. and Mrs. Bradley, with their two infant children—occupied one room; and the widow and a daughter an adjoining one. On Saturday morning Mrs. Stringer was found dead, as well as one of the young children—Mr. and Mrs. Bradley and the other child being all of them unconscious, though they recovered later. A strong smell of gas pervaded the Bradleys' room; and on examination there was found to be a leak in the pipe running up the wall. All the windows were closed. There was but little evidence of the presence of gas in Mrs. Stringer's bedroom; and it is therefore not possible as yet to state definitely that her death was caused by suffocation.

South Staffordshire Water Company.—The South Staffordshire Water-Works Company are about to enter upon important works at Burton-on-Trent. Owing to its elevation, the district known as Winshill, on the east bank of the Trent, has for many years suffered from an indifferent water supply; and there has been much negotiation between the Corporation and the Company on the subject. At a recent meeting of the Health Committee, a communication was received from the Company in which an agreement was enclosed whereby the latter agreed to construct works at Winshill at an estimated expenditure of £6500, providing the Corporation contributed £1000. These terms the Committee accepted; and it was resolved to recommend the Council to adopt them.

Price of Gas and Electricity to Large Consumers in Coventry.—The Electric Lighting Committee recommended at the last meeting of the Coventry City Council that any consumer of not less than 250,000 units per annum should be supplied in bulk at ¾d. per unit. Alderman West said all the charges had been included in this special rate, and a profit would be made. At the present time large consumers of electricity received the current at 1d. and a fraction per unit. Mr. Bettman proposed an amendment that a Special Committee be appointed from the Chairmen and Vice-Chairmen of the trading Committees, to consider the whole question of supplying gas and electric light and power to large consumers. The amendment was favourably received, and eventually carried.

Fatal Accident at the Mountain Ash Water-Works.—A fatal accident occurred last week while two men named Wilson and Carter were engaged in blasting operations at the new water-works of the Mountain Ash Urban District Council. They were working in a cutting 15 feet deep—Wilson turning a drill and Carter striking—when an explosion took place, which blew Wilson clean out of the cutting, and hurled his body several yards away, causing instant death. Carter also received such severe injuries about the face and head that his life was despaired of. Seven holes had been bored; and the foreman believed that all had exploded. It is, however, now thought that part of the charge in one of the holes must have been left, and been struck by the unfortunate men while drilling.

Messrs. Edgar Allen and Co., Limited, of Sheffield, have just received a repeat order for four of James and Allen's patent dust-proof measurers, for use at the electricity works, Sheffield. By this appliance the measure taken is automatically recorded.

A new water supply for the village of Helsby has lately been inaugurated. The scheme was prepared by Mr. A. Timmins, who, during the ceremony, gave some particulars of the well, and stated that the water available was of a high standard of purity, and sufficient to supply a population of 14,000. The pumps were started by Mr. J. T. Collier, the Chairman of the Helsby Parochial Committee.

INCLINED RETORTS.

PATENT "DWARF" INCLINED BENCH.

12 YEARS' Experience in actual building of Benches.

16 YEARS' in Manufacture of Conveyors and Elevators for same.

33 CONTRACTS COMPLETED.

Also Designers of every kind of Transport Appliance for Gas-Works.

SPECIALITIES:

ARCHD. LITTLE'S PATENT
Measure Chamber,
Coke Carrier,
Coke Conveyor,
Coal Conveyor,
Inclined Retorts,
AND
W. T. HOLLAND'S
Grit-Proof Bearings.

No Gas-Works is complete unless the above are in use.

Write for Estimates.

NEW CONVEYOR Co., LTD., SMETHWICK.

It is reported that there is a probability of a Company being formed to supply gas to Hathersage, near Sheffield.

According to a Laffan telegram, the Standard Oil Company have declared a dividend of 10 per cent. for the past quarter, making 40 per cent. for the year. Mr. Rockefeller's share comes to £4,000,000.

The Ammanford Urban District Council have entered into a contract with the Gas and Water Works Supplies and Construction Company, Limited, for the erection of gas-works and the supply of the district with gas.

The order for the gasholder required by the City of Waterford Gas Company, for which tenders were recently invited in the "JOURNAL," has been placed with Messrs. Willey and Co., Limited, who sent in the lowest tender.

Messrs. C. & W. Walker, Limited, have just secured an order for a three-lift gasholder, 118 feet in diameter, having 14 steel standards, for erection in an existing tank, for the Cambridge University and Town Gas Company.

The water supply of Spalding, which is obtained from a spring at the neighbouring town of Bourne, was cut off last Friday, owing to a fracture in the main at West Pinchbeck, where the water is carried under the River Glen.

A lamplighter in the employ of the Leatherhead Gas Company was last week summoned for damaging two street-lamps belonging to the Urban Council. A Police Sergeant said that he heard a smashing of glass; and on going in the direction of the sound, he found a street-lamp broken. He then heard a further smash, and saw the next lamp broken, and defendant walking away with a pole. He gave chase, and caught the defendant at the third lamp without the pole, which he had left at a corner of the road. Defendant was under the influence of drink. It was not the hour for extinguishing the lights. Defendant, who pleaded not guilty, was fined 23s., including costs.

The first of the series of Messrs. Alex. Wright and Co.'s classes for photometry, calorimetry, gas-works tests, and gas analysis was held on Saturday. The entire series will extend over three months.

The Daimler Motor Car Company have installed a Keith light plant of 60,000-candle power in the latest extension of their works at Coventry. We understand that this was done through the agency of Mr. Fletcher W. Stevenson, the Gas Engineer to the Corporation.

The Brechin Gas Company, Limited, was registered in Edinburgh last week to acquire and carry on the business of the Brechin Gaslight Company. The capital is £25,000, divided into 500 preference and 2000 ordinary shares, of £10 each in both classes. The public are not invited to subscribe.

The first annual dinner of the Northern District Gas Companies' Cricket League was held last Saturday at the "Red House," Tottenham—Mr. E. L. Burton (Secretary of Southgate Gas Company) in the chair. In proposing the toast of the evening, the Chairman said the idea in forming the League was a good one; and he hoped it would continue to be a success. Much was due to the Secretary (Mr. C. O. Banks), and also to the President (Mr. A. E. Broadberry) for his gift of a shield. Mr. Banks having replied, the prizes were distributed. In presenting the shield to the Commercial Gas Company's club, the Chairman proposed a vote of thanks to the donor, which was enthusiastically accorded. He afterwards presented each member of the team with a medal; and the gifts were acknowledged by Mr. Cox. Mr. J. Randall (Secretary of the Tottenham Gas Company) proposed "The Chairman." Mr. Burton responded, and moved a hearty vote of thanks to the Secretaries and Captains of the various clubs for their work during the past season. A pleasant evening was then brought to a close; but before the company separated Mr. Burton promised to give a bat annually for the best batting average, and Mr. Randall a prize for the best bowling average, throughout the League.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER. Burslem Gas Department. Applications by Nov. 29.
GENERAL MANAGER TO GAS PLANT FIRM. No. 4499.
ENGINEER FOR CONTINENTAL GAS-WORKS. No. 4505.
MAINLAYER. No. 4508.

Situations Wanted.

ASSISTANT-MANAGER OR WORKS FOREMAN. Tully, New Southgate.
SHOW-ROOM MANAGER AND SALESMAN. No. 4504.
GASFITTER. Sheppard, Matlock.
MANAGER TO GAS PLANT FIRM. No. 4506.
ASSISTANT ENGINEER OR MANAGER. No. 4507.
REPRESENTATIVE OF GOOD FIRMS. No. 4501.

Plant (Second-hand) Wanted.

TOWER SCRUBBER. No. 4503.
EXHAUSTER. Scottish Cyanides Company.
GAS PLANT (6 millions capacity). Gas and Water Works Supplies and Construction Company.

Plant (Second-hand) for Sale.

PURIFIERS, STATION METER, AND ROTARY WASHER SCRUBBER WITH CONNECTIONS, &c. Portland Gas Department.

Stocks and Shares.

COMMERCIAL GAS COMPANY. Dec. 5.
CRAYS GAS COMPANY. Dec. 5.
MAIDSTONE GAS COMPANY. Dec. 6.
RIDDINGS GAS COMPANY. Dec. 1.
SOUTHEND WATER-WORKS COMPANY. Dec. 5.

TENDERS FOR

Fire-Clay Goods.

LEICESTER GAS DEPARTMENT. Tenders by Dec. 2.
SHEFFIELD GAS COMPANY. Tenders by Dec. 1.

Gas-Works (Complete).

GAS AND WATER SUPPLIES AND CONSTRUCTION COMPANY.

Oil for Gas Making.

GOSPORT GAS COMPANY. Tenders by Dec. 6.

Pipe Laying.

HERTS AND ESSEX WATER COMPANY. Tenders by Dec. 2.

Pipes and Connections.

LEICESTER GAS DEPARTMENT. Tenders by Dec. 2.

Sulphuric Acid.

SALFORD GAS DEPARTMENT. Tenders by Nov. 23.

Tar.

SHOTLEY BRIDGE AND CONSETT GAS COMPANY. Tenders by Dec. 6.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 529.

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	21⅛—22⅛	..	4 13 4
160,000	10	,,	7⅞	Do. 7 p.c.	14⅛—15⅛	..	4 16 9
200,000	5	Nov. 15	7	Bombay, Ltd.	6½—7*	..	5 0 0
40,000	5	,,	7	Do. New, £4 paid	5—5⅛	..	5 1 10
53,000	10	Aug. 31	14	Bourne- mouth Gas & Water	B 7 p.c.	..	4 13 4
51,810	10	,,	7		Pref. 6 p.c.	..	3 17 9
53,200	10	,,	6			..	3 12 9
380,000	Stk.	Aug. 16	12½	Brentford Consolidated	258—263	..	4 15 1
300,000	,,	,,	9½	Do. New	197—202	..	4 14 1
70,000	,,	,,	5	Do. 5 p.c. Pref.	125—130	..	3 16 11
236,250	,,	June 15	4	Do. 4 p.c. Deb.	103—106	..	3 15 6
220,000	Stk.	Sept 15	11¼	Brighton & Hove Orig.	220—225	..	5 0 0
246,320	,,	,,	8¼	Do. A. Ord. Stk.	160—165	..	5 0 0
460,000	20	Sept. 28	10	British	42½—43½	..	4 11 11
100,000	Stk.	Aug. 16	6	Bromley, Ord. 5 p.c.	120—123	..	4 17 7
165,700	,,	,,	4½	Do. do. 3½ p.c.	90—93	..	4 16 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	12½—13	..	5 7 8
250,000	Stk.	June 29	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
150,000	20	July 13	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 28	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Oct. 27	4½	Do. 4½ p c Pref.	10—10⅜	..	4 5 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	102—104	..	4 6 7
1,134,680	Stk.	Aug. 31	5⅛	Commercial 4 p.c Stk.	116—118	+½	4 8 1
560,000	,,	,,	5	Do. 3½ p.c. do.	113—115	+½	4 6 11
450,000	,,	June 15	3	Do. 3 p.c. Deb. Stk.	86—88	..	3 8 2
800,000	Stk.	,,	6⅛	Continental Union, Ltd.	126—129	+4	5 0 9
200,000	,,	,,	7	Do. 7 p c Pref.	140—145	..	4 16 7
424,070	Stk.	—	5½	Derby Con. Stk.	—	..	—
55,000	,,	June 3	4	Do. Deb. Stk.	—	..	—
486,090	10	July 28	11	European, Ltd.	21½—22½	−½	4 17 9
354,060	10	,,	11	Do. £7 10s. paid	14½—15½	..	5 6 5
15,223,235	Stk.	Aug. 16	4⅛	Gas- light Coke	4 p.c. Ord.	..	4 6 9
2,600,000	,,	,,	3½		3½ p.c. max.	..	3 16 1
3,799,735	,,	,,	4	and	4 p.c. Con. Pref.	..	3 10 10
4,193,975	,,	June 15	3		3 p.c. Con. Deb.	..	3 8 2
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.		..	4 19 0
70,000	10	Oct. 13	11	Hongkong & China, Ltd.		..	5 7 4
3,800,000	Stk.	Nov. 15	10	Imperial Continental		+5	4 10 1
473,600	Stk.	Aug. 16	3½	Do. 3½ p.c. Deb. Red.		..	3 11 5
175,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.		..	4 13 9
561,000	Stk.	Aug. 16	10	Liverpool United A		..	4 4 9
718,100	,,	,,	7	Do. do. B		..	4 0 6

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
306,083	Stk.	June 29	4	L'rpool Unit'd Deb. Stk.	111—113	..	3 10 10
75,000	5	,,	5	Malta & Medn., Ltd.	4⅞—5	..	5 0 0
560,000	100	Oct. 2	5	Met. of 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 15	3½	Monte Video, Ltd.	11½—12⅝*	..	5 12 0
1,565,892	Stk.	July 29	4⅝	Newc'tle & G'tesh'd Con.	100—101	..	4 5 8
406,625	Stk.	June 29	3½	Do. 3½ p.c. Deb.	99—101	..	3 9 4
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	18½—19½	..	5 2 7
52,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	May 12	8	Oriental, Ltd.	150—153	..	5 4 7
600,000	5	Sept. 14	7	Ottoman, Ltd.	6—6½	..	5 7 8
168,255	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	6	Primitiva Ord.	7—7⅛	+3/32	4 2 9
796,980	5	July 28	5	Do. 5 p.c. Pref.	5⅝—5⅞	..	4 13 0
488,900	100	June 1	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
851,070	10	Oct. 13	7	River Plate Ord.	12⅜—13⅛	..	5 5 8
300,000	Stk.	June 29	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
250,000	10	Sept. 28	7	San Paulo, Ltd.	13—13⅛	..	5 3 8
70,020	50	July 1	5	Do. 5 p.c. Deb.	51—53	..	4 14 4
135,000	Stk.	Sept. 14	10	Sheffield A	243—245	..	4 1 8
209,984	,,	,,	10	Do. B	243—245	..	4 1 8
523,498	,,	,,	10	Do. C	243—245	..	4 1 8
126,106	Stk.	Aug. 31	5½	Shrewsbury Ord. 5 p.c.	104—106	..	5 3 9
70,000	10	Sept. 28	10	South African	15½—16½	..	6 1 3
6,250,000	Stk.	Aug. 16	5½	South Met., 4 p.c. Ord.	134—133	+1	4 2 8
1,895,445	,,	July 13	3	Do. 3 p.c. Deb.	87—89	..	3 7 5
575,000	Stk.	Aug. 16	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	125—130	..	3 16 11
112,533	,,	July 13	5	Do. 5 p.c. Deb. Stk.	132—137	..	3 13 0
502,310	Stk.	Nov. 15	5	Southampton Ord.	109—112*	+½	4 9 3
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6½	Tottenham and Edmonton	A 5 p.c.	..	122—125
363,020	,,	,,	4⅝		B 3½ p.c.	..	56—99
125,000	,,	June 29	4		4 p.c. Deb.	..	105—108
182,380	10	June 15	8	Tuscan, Ltd.		..	5⅜—10¼
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.		..	100—102
30,000	Stk.	Aug. 16	7⅞	Wands- worth and Putney	A 5 p.c.	..	—
255,636	,,	,,	6¼		B 3½ p.c.	..	137—140
60,000	,,	,,	5 7/16		C 3½ p.c.	..	113—116
57,564	,,	June 29	3		3 p.c. Deb. Stk.	..	82—85
745,872	,,	Aug. 16	5	West Ham 5 p.c. Ord.		..	105—107
185,000	,,	,,	5	Do. 5 p.c. Pref.		+1	123—126
193,300	,,	June 29	4	Do. 4 p.c. Deb. Stk.		..	104—109

Prices marked * are "Ex. div." † Next dividend will be at this rate.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C. **Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.**

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND Co, LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

"NUGEPE" GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

SPENT OXIDE.
THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

TAR AND LIQUOR WANTED.
Best Prices paid.
DENT AND CO.,
Ouse Chemical Works, SELBY.

GAZINE—A radical Solvent and Preventative of Naphthalene deposits, which has been used for many years on the Continent for the cleaning of Mains and Services, and is now being adopted in England. It is also used for the Enrichment of Gas, and has an Illuminating Value of double that of 90 per cent. Benzol.
Supplied by C. BOURNE, 120, Manor House Road, NEWCASTLE-ON-TYNE.

GLASS SHADES of every description, for all kinds of Interior **GAS LIGHTING.** Illustrated sheets on application.
JOHN WALSH WALSH,
SOHO AND VESTA GLASS WORKS, BIRMINGHAM.
Telegrams: "VESTA, BIRMINGHAM."
National Telephone: No. 63.
London Show-Room: 4, HOLBORN CIRCUS, E.C.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
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SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd., HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON.
General Manager (for Scotland)—
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HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

TO WATER AND GAS COMPANIES REQUIRING CAPITAL.
THE Water and Gas Debenture Share Investment Trust, Limited, of 37, High Street, Tunbridge Wells, are prepared to Invest £10,000 Capital in above, and also to Underwrite Progressive Water and Gas Companies' issues.

THE KEITH LIGHT.
OVER 2000 INSTALLATIONS IN DAILY USE.
SEE illustrated advertisement in next week's issue.
JAMES KEITH AND BLACKMAN CO., LTD., 27, Farringdon Avenue, LONDON, E.C.

SITUATION wanted as Gas-Fitter. Age 25. Ten Years Experience in Main and Service Laying and House Fitting.
Address H. SHEPPARD, 3, Lime Grove, MATLOCK.

GAS Engineer about to open Office in Manchester, desires to REPRESENT in that District One or Two good Firms doing Business with Gas-Works.
Address No. 4501, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SITUATION Wanted as Assistant MANAGER or WORKS FOREMAN. Age 24. Experienced in Adjusting and Working Regenerative Settings, Slopers, Horizontals, and Machine Stokers, Water-Gas Installations, Sulphate and Ammonia Concentrating Plants, and General Gas-Works Construction. Good Chemist and Draughtsman.
Address, S. J. B. TULLY, 2, Pembroke Road, NEW SOUTHGATE.

SITUATION wanted as Assistant- ENGINEER or MANAGER of Medium Sized Gas-Works. Thorough training in large modern Works. Good Chemist and Draughtsman. Eight Years practical Experience in Gas-Works Management and Routine, and Erection and Starting of New Plant, &c.
Address No. 4507, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a position as Show-Room MANAGER and SALESMAN. Ten Years' Practical Experience, and thorough knowledge of all Latest and Up-to-date Gas Appliances, both Cooking, Heating, and Lighting, Maintenance of same, and new methods of pushing business. Conversant with Accounts and General Routine of Gas Office Duties. Applicant is willing to start at small Salary with Commission on Increased Business. First-Class Testimonials. Age 30.
Address No. 4504, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Quotations and Samples on application.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT for all Retort and Furnace work.
PAINT for Gasholders, Purifiers, &c.
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, & MESSEL, LTD.
(with which is amalgamated WM. PEARCE & SONS, LTD., 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341, AVENUE.

ADVERTISER, engaged as Assistant GENERAL MANAGER with large Firm of Gas-Plant Manufacturers in the Midlands, seeks an engagement where his intimate knowledge of Construction and Prices of Gasholder, Chemical, and Gas Plant Work would meet with adequate remuneration.
Address, No. 4506, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, an experienced Main-Layer, accustomed to large and small Mains and to the Control of Men. Must be steady and reliable.
Apply, giving Particulars of Experience, References, Age, and Wages required, to No. 4508, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GENERAL MANAGER.
WANTED, a General Manager for a Gas Engineering and Constructional Works in the Midlands. Must be well up in Estimating, Management of Men, and the Introduction of up-to-date Labour-Saving Machinery, &c.
Address, stating Age, Experience, and Salary required, to No. 4499, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ENGINEER REQUIRED.
WANTED, the Services of a young ENGINEER well qualified for the Supervision of an important Gas-Works on the Continent. He must be Experienced in the Manufacture and Distribution of Gas, have a sound knowledge of the Construction of Plant, and of Chemistry applicable to the business.
Applications, accompanied by not more than Three Testimonials, to be sent to No. 4505, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF BURSLEM.
THE Corporation of Burslem invite APPLICATIONS for the position of GAS-WORKS MANAGER.
Candidates must have had Practical Experience as Manager or Assistant-Manager of a large Gas-Works.
Any Candidate canvassing members of the Council will be disqualified.
Applications, marked "Gas Committee," with not more than Three recent Testimonials, and stating Age, Experience, and Salary required, to be addressed to me, not later than the 28th of November, 1905.
ARTHUR ELLIS,
Town Clerk.

WANTED, a good Second-Hand Tower- SCRUBBER, suitable for Works Carbonizing 3000 to 4000 Tons per annum.
Send Price and Particulars, to No. 4503, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED to Purchase, any good Second-Hand GAS PLANT and CONNECTIONS for Gas-Works of about 6 Million cubic feet. It is essential that it should be in excellent condition.
TENDERS are likewise required for the supply and erection of a COMPLETE GAS-WORKS, capable of turning out 6 Million feet per annum.
Full Particulars to the GAS AND WATER WORKS SUPPLIES AND CONSTRUCTION COMPANY, LIMITED, 99, Cannon Street, LONDON, E.C.

EXHAUSTER wanted, Belt Driven, with Pulley, 10,000 to 15,000 Cubic Feet per hour. Good Condition.
State Maker and lowest Price to the SCOTTISH CYANIDE COMPANY, Leven, FIFE.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

PORTLAND URBAN DISTRICT COUNCIL
(GAS DEPARTMENT)

HAVING the following to dispose of at once, OFFERS are invited:—
One Set of PURIFIERS (3), size 10 ft. 6 in. by 10 ft. by 3 ft. 6 in., with Fittings, comprising one Four-Way Centre Valve and Connections, Grids and Cross-Bars, one Lifting and Travelling Crane with Rails complete.
One (Cowan) STATION METER to pass about 5000 cubic feet of gas per hour, Complete with Valves and Bye-Pass, Clock, and Tale-Tell.
One (Kirkham Hulett's) ROTARY WASHER-SCRUBBER Complete with Connections, Valves, and Seal Pot (can be seen at work).
For further Particulars, apply
J. HANSFORD,
Engineer and Manager.
Gas-Works, Portland,
Dorset.

FIRE-CLAY GOODS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the supply of SILICA and FIRE-CLAY GOODS required at their Neepsend, Effingham Street, and Grimesthorpe Stations during the next Twelve Months.
Specifications and Forms of Tender may be obtained upon application to the Company's Engineer, Mr. J. W. Morrison.
The Directors do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, marked "Tender for Fire-Clay Goods," must be delivered by post to the undersigned not later than the first post on Friday, Dec. 1, 1905.
HANBURY THOMAS,
General Manager and Secretary.
Commercial Street,
Sheffield, Nov. 10, 1905.

GOSPORT GAS AND COKE COMPANY.
GAS OIL.

THE Directors invite Tenders for their requirements of GAS OIL suitable for the Manufacture of Carburetted Water Gas, for the Year 1906.
Full Particulars and Form of Tender can be obtained on application to the Engineer, Mr. W. H. Adams, Gas-Works, Gosport.
Tenders, endorsed "Gas Oil," to be delivered to the undersigned not later than the 6th prox.
The lowest or any Tender not necessarily accepted.
ALFRED LOACH,
Secretary.
Gas Offices, 142, High Street,
Gosport, Nov. 14, 1905.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of about 1800 Tons of SULPHURIC ACID, to be delivered during the Year 1906.
Full Particulars may be obtained on application to Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.
Sealed Tenders, endorsed "Tender for Acid," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Thursday, the 23rd of November, 1905.
By order,
L. C. EVANS,
Town Clerk.
Town Hall, Salford,
Nov. 16, 1905.

SHOTLEY BRIDGE AND CONSETT DISTRICT GAS COMPANY.
TENDERS FOR TAR.

THE Directors of this Company invite TENDERS for the purchase of the TAR to be produced at their Works during the Year 1906. Quantity, about 70,000 Gallons.
The Contractor to find his own Casks and to accept delivery at Blackhill Station.
Tenders to be sent not later than Wednesday, Dec. 6.
M. RICHLEY,
Secretary.
Shotley Bridge, Nov. 18, 1905.

CORPORATION OF LEICESTER.
RETORTS AND FIRE-BRICKS.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of RETORTS and FIRE-BRICKS required during the Year 1906.
Specifications, Quantities, and Form of Tender can be obtained upon application to the Engineer.
Tenders, addressed to Mr. Councillor Edwards, Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Dec. 2, 1905.
The Committee do not bind themselves to accept the lowest or any Tender.
ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.
Offices: Millstone Lane,
Leicester, Nov. 15, 1905.

CORPORATION OF LEICESTER.
CAST-IRON PIPES.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of the necessary CAST-IRON PIPES AND CONNECTIONS, from 2 inches to 36 inches in diameter, required during the Twelve Months ending Dec. 31, 1906.
Specification and Form of Tender may be obtained upon application to the Engineer.
Tenders, addressed to Mr. Councillor Edwards, Chairman, and endorsed "Tender for Cast-Iron Pipes, &c.," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Dec. 2, 1905.
The Committee do not bind themselves to accept the lowest or any Tender.
ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.
Offices: Millstone Lane,
Leicester, Nov. 17, 1905.

HERTS AND ESSEX WATER-WORKS COMPANY, LIMITED.
TO PIPE-LAYING CONTRACTORS.
CONTRACT No. 2.

THE Directors of the Herts and Essex Water-Works Company, Limited, are prepared to receive TENDERS for the LAYING of about 720 yards of 12-inch, and 2000 yards of 9-inch internal diameter Cast-Iron Socket Pipes.
The Specification and Plan may be inspected, and Forms of Tender may be had on payment of the sum of Two Guineas, to be returned on receipt of a *bonâ-fide* Tender, on application at the Office of Messrs. T. & C. Hawksley, Civil Engineers, 30, Great George Street, Westminster, S.W., on or after Saturday, the 18th day of November; and Tenders must be delivered at the Office of the Company, 28, Victoria Street, Westminster, addressed to the Secretary, at or before Ten o'clock in the morning of Saturday, the 2nd day of December, 1905.
The Company do not bind themselves to accept the lowest or any Tender.
WILLIAM JONES,
Secretary.
28, Victoria Street,
Westminster, S.W.

RIDDINGS DISTRICT GAS COMPANY.
SALE BY TENDER OF FIVE PER CENT. PREFERENCE SHARES.

THE Directors of the Ridding District Gas Company OFFER FOR SALE BY TENDER, 500 FIVE PER CENT. PREFERENCE SHARES of £10 each (or such number of Shares as will produce, including premiums, the sum of £5000).
Minimum Price, £10 per £10 Share.
The last day for the reception of Tenders is Friday, the 1st of December, 1905.
Particulars and Conditions of Sale may be obtained at the Offices of the Company.
By order of the Board,
ERNEST W. DREW,
Secretary.
Offices: 30, Gracechurch Street,
London, Oct. 26, 1905.

MAIDSTONE GAS COMPANY.

NOTICE is Hereby Given, that the Maidstone Gas Company offer for SALE BY TENDER TWO THOUSAND POUNDS (£2000) FIVE PER CENT. CAPITAL STOCK, being a portion of £75,000 Five per Cent. Capital Stock authorized to be raised under the Maidstone Gas Act, 1903; and also FOUR THOUSAND POUNDS (£4000) THREE PER CENT. DEBENTURE STOCK in the Maidstone Gas Company.
The Directors will be prepared to receive Sealed Tenders for the same addressed to the Offices of the Gas Company, St. Peter's Street, Maidstone, not later than Ten o'clock a.m. on Wednesday, the 6th day of December, 1905.
The purchase money of the Stock allotted must be paid up in full on or before the 30th day of December, 1905. Dividends will commence to accrue from the 1st of January, 1906.
The dividend on the Five per Cent. Capital Stock will be calculated half yearly to the 30th day of June and the 31st day of December in each year; and will be paid by Warrants payable on the 1st day of September and the 1st day of March respectively.
The Dividend on the Three per Cent. Debenture Stock will be calculated up to the 30th day of June and the 31st day of December in each year; and will be paid by Warrants payable on the 1st day of July and the 1st day of January respectively.
No deposit is required upon Tendering.
Any amount, not being less than £10 of Stock, and being a multiple of £5 of Stock, may be tendered for, and the Stock will be registered in the Company's books in the names of the Allottees or their nominees free of expense.
The minimum prices below which no Tender will be accepted have been fixed as under:—
£150 for each £100 of Five per Cent. Capital Stock.
£75 for each £100 of Three per Cent. Debenture Stock.
The last Dividend declared and paid on the Capital Stock was at the rate of £7 12s. 6d. per cent. per annum.
Particulars and Conditions of Sale, with printed Form of Tender attached thereto (upon which Form only Tenders will be received), may be obtained on application at the office of the undersigned, the Clerks to the Company, or at the Offices of the Company, St. Peter's Street, Maidstone.
By order,
HOAR, HOWLETT, AND TATHAM,
Clerks to the Maidstone Gas Company.
9, King Street, Maidstone,
Nov. 10, 1905.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
COMMERCIAL GAS COMPANY.
NEW ISSUE OF £25,000 THREE PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 5, at Two o'clock, in Lots.
Particulars of the SECRETARY of the COMPANY, at the Offices, Ben Jonson Road, STEPNEY, E.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.
NEW ISSUE OF £11,500 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 5, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
CRAYS GAS COMPANY.
NEW ISSUE OF £5000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 5, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

GILBERT LITTLE & CO'Y LTD.
Conveyor and Elevator Specialists,
Smethwick, Birmingham.
Make known your wants for Conveyors and Elevators to GILBERT LITTLE, the Pioneer Specialist; he will supply them.

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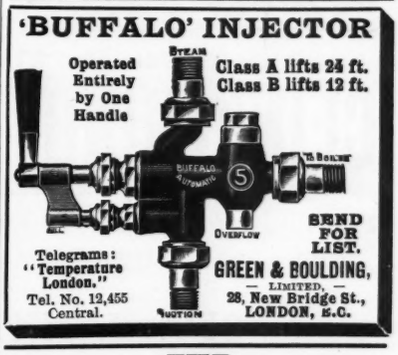
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Class A lifts 24 ft.
Class B lifts 12 ft.
SEND FOR LIST.
Telegrams: "Temperature London."
Tel. No. 12,455 Central.
GREEN & BOULDING,
— LIMITED, —
28, New Bridge St., LONDON, E.C.

THE "ROTARY" STATION METER.
Efficiency Demonstrated.
APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE, MANCHESTER.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.
THE GRASSMOOR CO., LD., CHESTERFIELD.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works (also large Stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

THOMAS TURTON
AND SONS, LIMITED
SHEAF WORKS, SHEFFIELD
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
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LONDON OFFICE:
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LIME & OXIDE ELEVATORS & CONVEYORS.
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HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.

GASHOLDER TANKS. BUILDINGS.
THOMAS VALE & SONS, LTD.,
Contractors, STOURPORT.
CARBONIZING WORKS.
KLONNE SETTINGS A SPECIALITY. High-Class Work Only.

BOWENS' Ltd. Successors,
STOURBRIDGE.
MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
ESTABLISHED 1860.

TIMMIS'S PATENT
CLINKERING DOOR.
For Illustrated Advertisement, with full Particulars, see "JOURNAL" for April 4, p. 66.
GEO. H. TIMMIS,
River Stour Works, STOURBRIDGE.
Telegrams: "TIMMIS, LYE." National Telephone: 13, LYE.
or of HARPER & MOORES, LTD.,
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Registered Offices
Adjoining Lye Station, G.W. Railway.
Telegrams:
"Harrison, Lye."
GEORGE K. HARRISON,
LIMITED,
Proprietors of
STOURBRIDGE FIRE-CLAY MINES,
BRICK WORKS, & COLLIERIES,
STOURBRIDGE.
Works, Collieries, and Mines:
BRETTELL LANE, NAGERSFIELD, and LYE.

TWO UNIQUE MANTLES.

Give a brilliant Daylight effect.
Do not drop off or fall to pieces.
Ensure pure air and clean ceilings with economy of Gas.
Write for Trade Prices to the Manufacturers,
RAUM & CO.,
25, Bartlett's Buildings, E.C.,
or to Wholesale Agents,
EVERED & CO.,
— LIMITED, —
27-35, Drury Lane,
W.C.

Patent applied for. Registered.

GREAT NOVELTY
THE
'ROYAL' INCANDESCENT
GAS-LIGHT CANDLE.
The most decorative Gas-Light ever offered.
A perfect combustion Burner.
Cannot get out of order.
60-Candle Power with 2½ cubic feet of Gas.
Can be used anywhere instead of a "C" Burner.
Address of your nearest Wholesale Factor will be sent on application to No. 4374, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

KING'S

Pressure Gauge

IN

CAST IRON.

WITH LARGE DIALS

11½ & 16½ inch diameter.

For CLEAN or FOUL GASES.

Any Range of Pressure or Exhaust.

MADE BY

JAMES MILNE & SON

LIMITED,

Milton House Works, EDINBURGH . . .

Also at LONDON, GLASGOW, and LEEDS.

IF YOU WANT

To see 'STARS'

INVERTED,

Try the 'INVERTED'

STAR BURNER.

A Crown of Light

FOR

Half-a-Crown.

No. 4 Midge Burner and Mantle.

WRITE FOR CATALOGUE & DISCOUNTS.

THE 'STAR' INVERTED INCANDESCENT BURNER CO., LTD.,

104-105, GREAT SAFFRON HILL,

Telephone: 5179 Holborn. LONDON, E.C. Tel. Address: "Invertamus, London."

EVERITT'S PATENT TAR EXTRACTOR

As a Naphthalene Remover.

The Exhaust Steam used warms up the Tar in the Gas, and enables it to remove the maximum amount of Naphthalene. By removing the suspended Tar none is carried forward to the Scrubbers, except in strong and thorough combination with an **EXCESS** of light hydrocarbons, and therefore no Naphthalene is freed by the action of the ammonia on the phenols in the Tar liberating Naphthalene dissolved by them.

SOLE MAKERS:

ROBERT DEMPSTER & SONS,

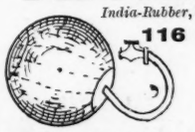
ROSE MOUNT IRON-WORKS, LTD.,

ELLAND, Yorks.

THOMAS BUGDEN,

India-Rubber, Guttapercha, Air-proof, and Waterproof Manufacturer,

116 & 118, Goswell Road, LONDON.



Gas Bags for repairing Mains, Round Shape. All Seams Stitched and Taped.

Gas Bags for repairing Mains, Cylinder Shape. All Seams Stitched and Taped.

Oilskin Clothing, Diving and Wading Dresses, Sewer Boots, Tar Hose, Stokers' Mitts, Bellows, &c.

Sewer and Fireman's Boots and Stockings.

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Contractors' and Miners' Woollen Jackets, Trousers, Hats, &c.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.
LONDON OFFICE: H. CRESSWELL & CO., LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

JOHN HALL & CO.,
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Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.
RETORTS CAREFULLY PACKED FOR SHIPMENT.

MIRFIELD GAS COAL
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.
Please apply for Prices, Analyses, and Reports, to the
MIRFIELD (GAS COAL) COLLIERIES
RAVENSTHORPE, NEAR DEWSBURY.
LONDON: 22, Park Village East, N.W.

Success

is writ large

Sydney upon the face of the "Sydney" Lamp. It is a lamp that is destined to play a conspicuous part in the world of incandescent lights. It is the perfection of inverted cluster lights—reliable, brilliant, handsome, and compact. Does its duty without a hitch. The reason is simple—it is made of **K** Burners. Moffat's, Ltd., 155, Farringdon Road, London, E.C. Sydney

THE LEEDS FIRECLAY CO., LTD.,

CLIFF'S BRAND.
INGHAM'S BRAND.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

Patent MACHINE-MADE RETORTS

These Patent Machine-Made Retorts possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made. *Retorts carefully Packed for Export.*

LONDON: 2 & 3, NORFOLK STREET, STRAND, W.C.
LEEDS: 20, Park Row. LIVERPOOL: 21, Leeds Street.

The Features of the

"SIMPLEX" PREPAYMENT METER.

NO REMOVAL OF METER.

NO Seals to hack out.
NO Screw Head to find.
NO reaching over Meter.
NO Numbers to look for.
NO Re-screwing.
NO Re-sealing.
NO bent Coin that is inserted into the Mechanism will jamb it.
NO second Coin can be inserted until previous one released by turning the handle.

TO CHANGE PRICE

merely unlock Padlock of Money Box, lift Flap at side, and change wheel.

THIS CAN BE DONE IN 30 SECONDS.

The Valve can be readily taken out to remove obstructions at any time without taking Meter down.

ALL BRASS AND GUN-METAL MECHANISM.

Ordinary and Prepayment Meters can be converted into SIMPLEX Prepayment or Convertible Stops.

QUOTATIONS ON APPLICATION.

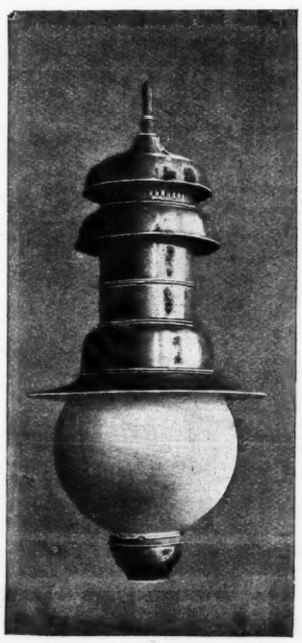
METROPOLITAN GAS METERS, LIMITED,

Works and Offices:
HYSON GREEN WORKS, NOTTINGHAM.
Telegraphic Address "GASOMETER, LONDON."
Telephone: 204 X NOTTINGHAM.

London Depot:
6, MALT STREET, OLD KENT ROAD, S.E.
Telegraphic Address: "GASOMETER, LONDON."
Telephone: 2044 HOP.

THE 'KHOMA' INCANDESCENT GAS-LAMP

Lamp with Globe up ready for use.



FOR EXTERIOR LIGHTING.

Patent No. 9747, 1904.

The Solution of the Problem of Outside Lighting by Incandescent Gas.

SPECIALLY RECOMMENDED TO GAS COMPANIES MAINTAINING LAMPS.

English Manufacture.

4 MANTLES—500-CANDLE POWER.

Solid Copper throughout, except Reflector, which is Enamelled Iron.

A Gas Lamp to be efficient must be maintained in perfect order, and the Globe and Chimneys kept clean. When Chimneys are used to protect Mantles they quickly become dirty, thus obscuring the light. The breakage of Chimneys also destroys a large percentage of Mantles. The "Khoma" exterior lamp eliminates the necessity of Chimneys, and enables one to clean the Globe or replace a Mantle without subjecting the other Mantles to the breeze.

KHOMA GAS ARC LAMP, LTD.

Office and Works:
96, MIDDLESEX STREET, LONDON, E.

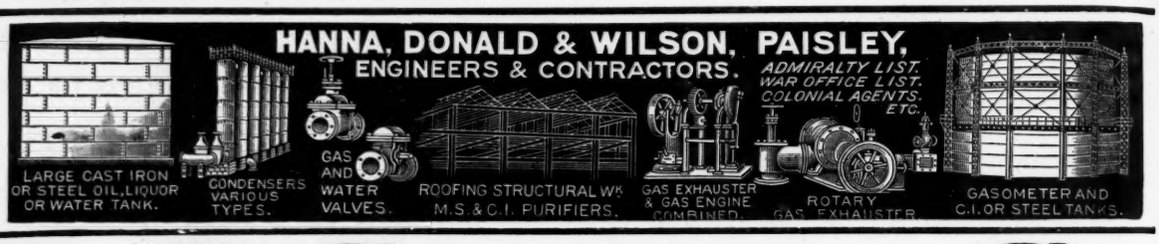
Globe lowered, showing wind-proof shield with door open for access to Mantles. Bottom cup can be removed for Globe cleaning.

GAS METERS.
SLOT METERS.
GEYSERS.
COOKERS.
STOVES.
WORKSHOP LAMPS.
GAS IRONS.
IND. GAS APPLIANCES.
FITTINGS.

CENTRAL WORKS in DESSAU
OF THE
GERMAN CONTINENTAL GAS ASSOCIATION
(Deutsche Continental Gas Gesellschaft).

For Illustrated Price Lists and full Particulars apply to our SOLE AGENTS FOR THE UNITED KINGDOM AND COLONIES:

THE INCANDESCENT LIGHTING & MANTLE INSURANCE CO.,
57/58, CHANCERY LANE, LONDON, W.C.
Telephone: 12788 CENTRAL. Telegrams: "FRAENKL, 58, CHANCERY LANE."


HANNA, DONALD & WILSON, PAISLEY.
ENGINEERS & CONTRACTORS.
ADMIRALTY LIST.
WAR OFFICE LIST.
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ETC.
LARGE CAST IRON OR STEEL OIL, LIQUOR OR WATER TANK.
CONDENSERS VARIOUS TYPES.
GAS AND WATER VALVES.
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GAS EXHAUSTER & GAS ENGINE COMBINED.
ROTARY GAS EXHAUSTER
GASOMETER AND C.I. OR STEEL TANKS.

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CARBONIZING SPECIALISTS.

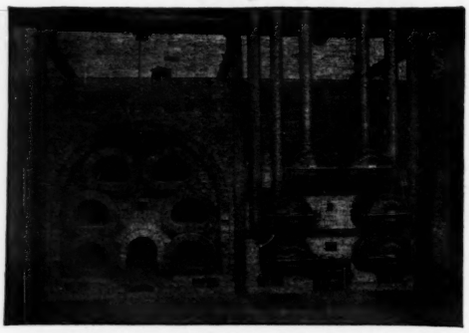


PHOTO. OF REGENERATOR SETTINGS DURING CONSTRUCTION.

REGENERATOR & GENERATOR SETTINGS

DEEP, SEMI-DEEP, AND SHALLOW.
Maximum Make per Ton and Mouthpiece.
Minimum Fuel Consumption.
NUMEROUS REPEAT ORDERS
Have been received for each of the above types of Settings.

RESULTS GUARANTEED. RETORTS RESET.

SOLE MAKERS OF **CRIPPS' PATENT CHIMNEY.**

Designs and Estimates on application. 28, EAST PARADE, **LEEDS.**

IMPORTANT NOTICE.

It is the practice of the "Gas World" to publish from time to time analyses of the accounts of Gas Undertakings in this Country. A number of such analyses appeared in the issue for September 16, and they show that at Fenton, Longton, Rotherham, and Tipton, some of the highest results were obtained in Gas Made and Coke Sold.

It may be interesting to Gas Engineers to learn that at these four places Winstanley's Settings are in use.

The Winstanley Speciality Company, Newton Chambers, Cannon Street, Birmingham.

Every Description of
FIRE-CLAY GOODS
OF BEST QUALITY ONLY.

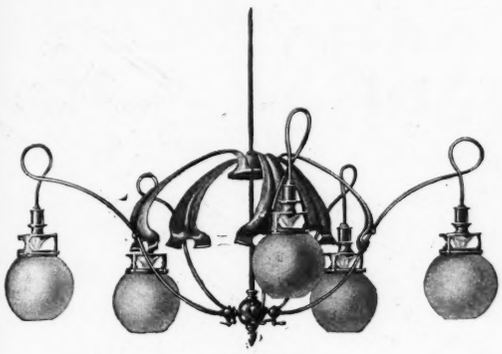
Personal attention given to all orders.

MOBBERLEY & PERRY, STOURBRIDGE.

INCLINED AND HORIZONTAL RETORTS of both Taper and Parallel Sections.
SPECIALS FOR WATER GAS PLANTS
CHECKER BRICKS ALWAYS IN STOCK
LARGE STOCKS KEPT.

THE ORIGINAL NEW INVERTED BURNERS.

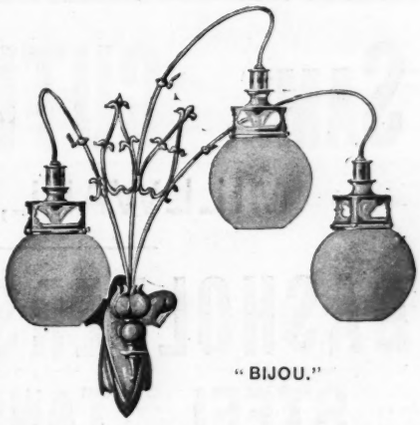
ARTISTIC! ECONOMICAL!



"BIJOU."

All Mantles we supply are made of best double-woven Ramie, and marked with our Trade Mark,

"NICO."



"BIJOU."

The "BIJOU" BURNER is the neatest, most decorative, and economical ever known, and is the real rival to Electric Light at One-tenth the cost.

No. 2 Burner.

New Season's Catalogue Now Ready.

Cluster Lamp. Fig. 6.

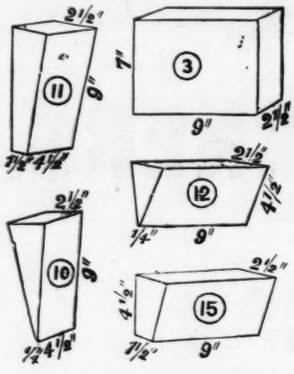
AN IDEAL LAMP FOR SHOP LIGHTING, WAREHOUSES, FACTORIES, PUBLIC BUILDINGS, and OUTSIDE LIGHTING.

The New Inverted Incandescent Gas Lamp Co., Ld.

23, FARRINGDON AVENUE, LONDON, E.C.

STEPHENS & CO., KIDWELLY.

Contractors to a large number of the Principal Gas-Works.



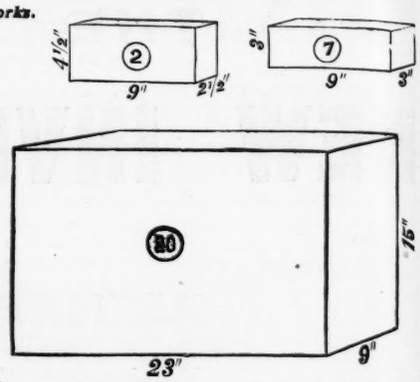
SPECIAL IMPROVED

SILICA BRICKS, BLOCKS, SHIELDS, TILES.

SPECIAL PLASTIC SILICA CEMENT.

Without doubt the finest Materials in the Market for Gas-Works Furnaces.

BRICKS, BLOCKS, TILES, & SHIELDS of any shape made to order.



SAML. CUTLER & SONS,

MILLWALL, LONDON.

GASHOLDERS.
STEEL TANKS.
CONDENSERS.
ROOFS.

JÄGER GRIDS CAPACITY OF PURIFIERS DOUBLED. PRESSURE CONSIDERABLY REDUCED.

Special Circular describing the Jäger System of Purification on application.

CARBURETTED WATER GAS

Maximum Efficiency Guaranteed.

A LARGE NUMBER OF PLANTS IN OPERATION.

Every Requirement for Gas-Works.

(196.)

THE SILICA FIRE-BRICK COMPANY.

OUGHTIBRIDGE.

RADIATE MORE HEAT

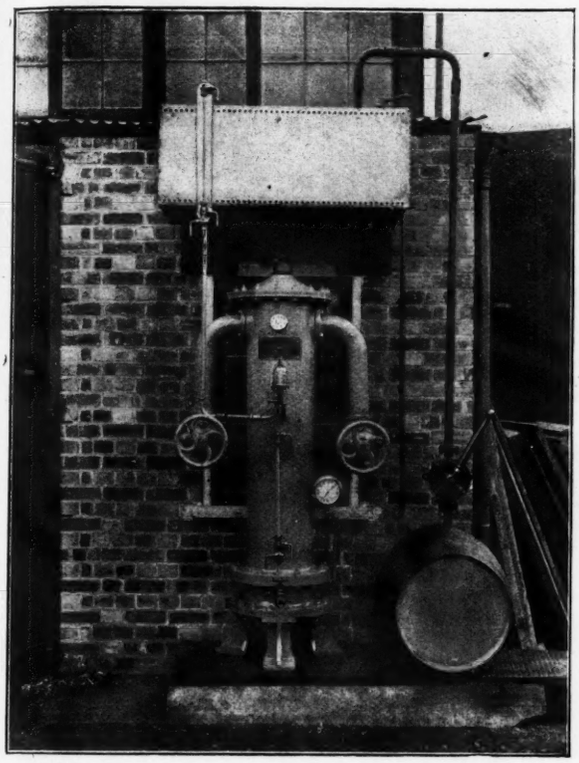
BY USING

SILCO BRICK RETORTS.

SILCO BRICKS prevent all settling of setting.

SILICA BRICKS for Combustion Chambers, any shape.

BIGGS, WALL, & CO.,



THE IMPROVED

"RAPID" CARBURETTOR

RELIABLE, PERMANENT, AND INSTANTANEOUS ENRICHMENT.

Dispenses with the use of Expensive Cannel.

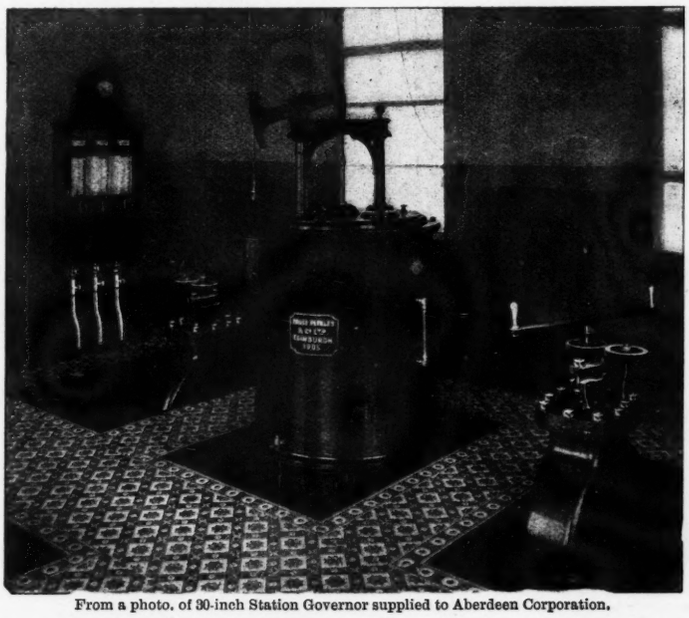
SAVES WORRY.

INCREASES THE MAKE PER TON OF COAL AND COKE SALES.

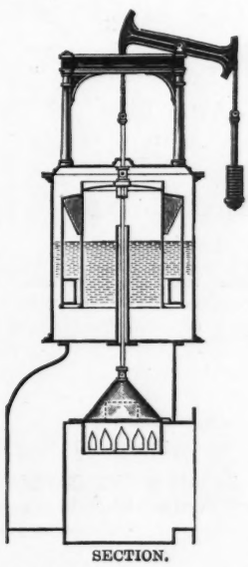
Offices: 13, CROSS ST., FINSBURY PAVEMENT,
LONDON, E.C.
Telegraphic Address: "Ragout, London." Telephone: No. 273 Central.
Works: NEW SOUTHGATE, LONDON.

PATENT SAFETY STATION GOVERNORS.

The result of many years' varied experience in their design and manufacture, they effectually Control Pressure under the most exacting conditions.



From a photo. of 30-inch Station Governor supplied to Aberdeen Corporation.



SECTION.

The Bell is enclosed and in communication with the outlet of the Governor, thus responding to the slightest variation in outlet Pressure. Small weights are conveniently placed for operating the Governor, or "The Peebles' System of Air-Loading" from a distance may be employed. All Governors are carefully tested before being dispatched, and the material and workmanship is of the best possible description.

BRUCE PEEBLES & CO., Ltd.,

Telegrams: "Peebles, Edinburgh." **TAY WORKS, BONNINGTON, EDINBURGH.** Telephone 4244.

ALBION IRON WORKS,
MILES PLATTING,

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TELEGRAMS—
"STOKER, MANCHESTER."

WEST'S GAS IMPROVEMENT CO., LD.

Gas and General Engineers.

CONTRACTORS FOR
COMPLETE RETORT-HOUSE PLANT

. . EITHER ON . . .

THE HORIZONTAL OR INCLINED SYSTEMS.

WEST'S STOKING MACHINERY— COMPRESSED AIR OR ELECTRICALLY DRIVEN AND MANUAL SYSTEMS.

Example of a

RETORT-HOUSE

illustrating the application of

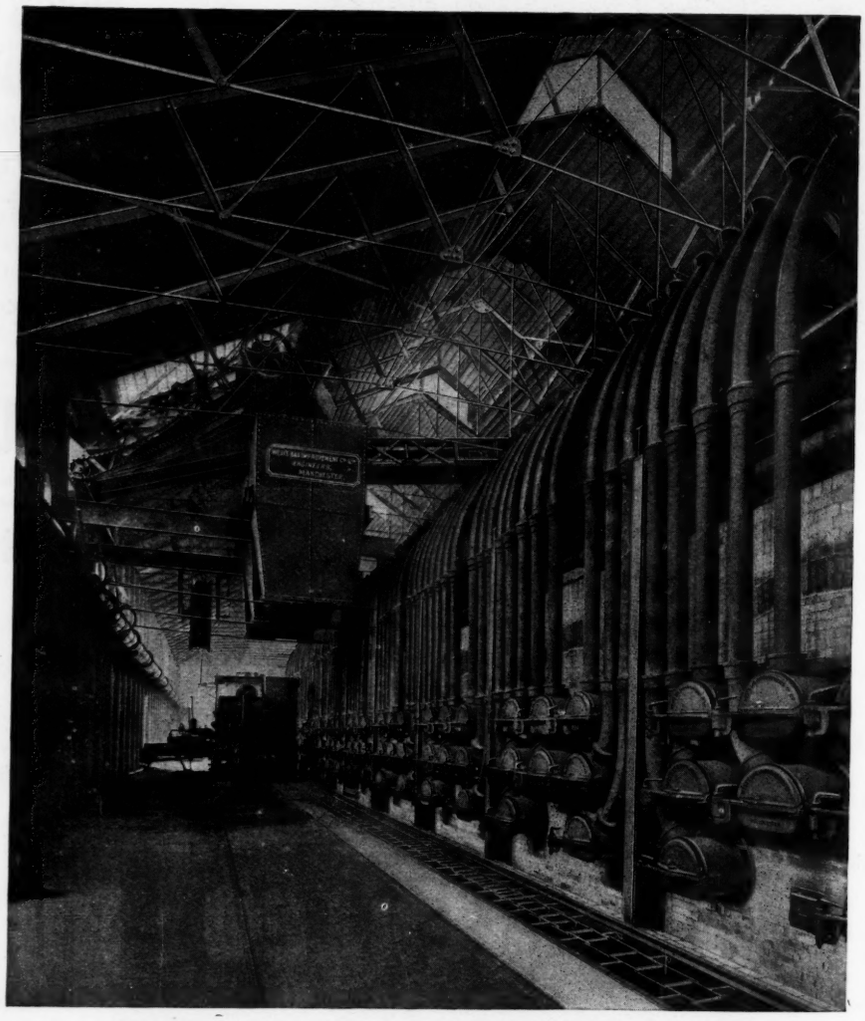
West's Regenerator Settings and Retort-Bench Fittings.

West's Coal and Hot Coke Plants.

West's combined Charging and Drawing Machines.

The "Bournemouth" Arch Pipe
WOODALL, HEAD, AND GREEN'S PATENT).

The "Hovey" Indicator
is fitted to the overhead Coal-Hoppers for gauging the depth of Coal contained in them.

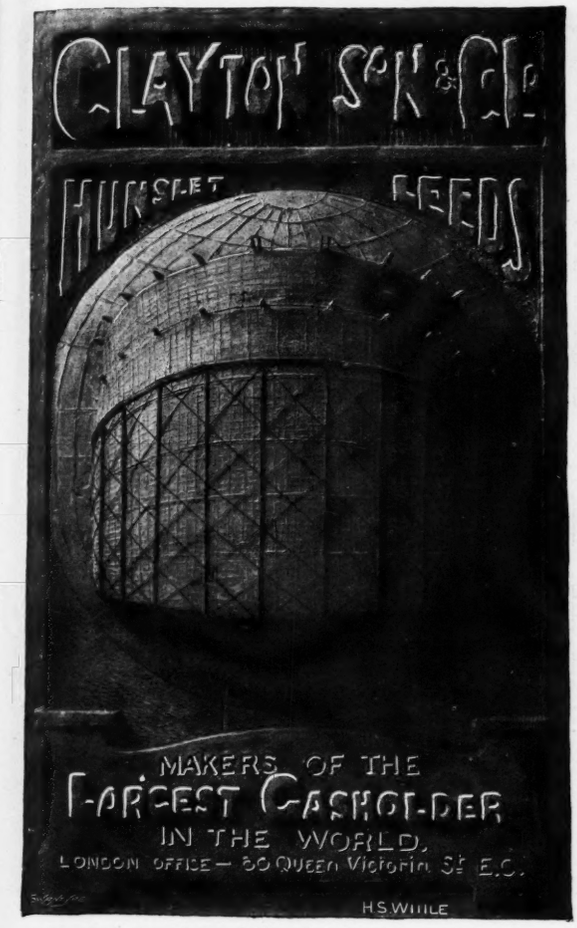


With the **WEST'S COMBINED CHARGING AND DRAWING MACHINE** all classes of coal can be efficiently dealt with, and it requires only One Machine Driver and One Attendant to charge and draw the Retorts, attend to the Mouthpieces, and fill the Furnaces.

COAL AND COKE BREAKING, ELEVATING, AND STORING PLANTS

BELTON'S PATENT AUTOMATIC RELIEF APPARATUS FOR HYDRAULIC MAINS.

Manufacturers for America: Riter-Conley Manufacturing Company, Pittsburg.



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LAMP POSTS

made throughout of
WELDLESS STEEL TUBING
including base, ring, and ladder rest.

Light, Strong, Unbreakable, and Cheap.

GAS, WATER, & STEAM TUBES AND FITTINGS.

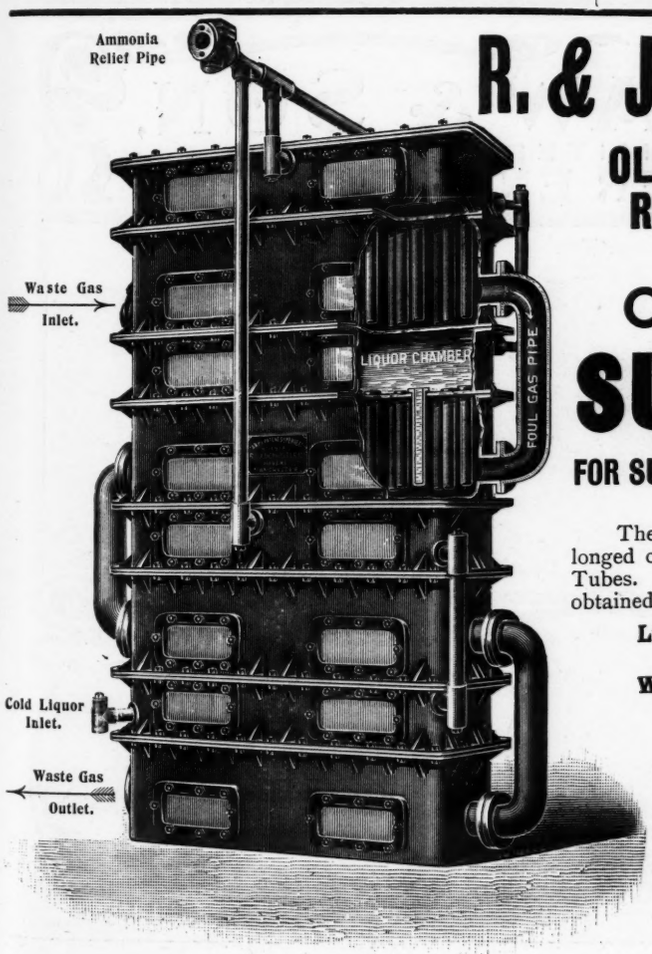
WELDLESS STEEL SPIGOT & FAUCET PIPES for Gas and Water Mains.

Tubes can be supplied up to 10 inches diameter and in lengths up to 40 feet.

THE BRITISH MANNESMANN TUBE COMPANY, LTD.,

110, CANNON ST., LONDON, E.C.

Birmingham Depôt: Bridge Works, LISTER ST.
Works: LANDORE, SOUTH WALES.



R. & J. DEMPSTER, LTD.,

OLDHAM ROAD, MANCHESTER.

CARR'S PATENT SUPERHEATER

FOR SULPHATE OF AMMONIA OR OTHER PLANTS.

The rectangular shape of this Superheater effects a prolonged contact of the waste heat with the depending Liquor Tubes. In Superheaters at work the following efficiency is obtained:—

Liquor Inlet to Superheater ..	**64° F.**
„ Inlet to Still	**191° F.**
Waste Gas Inlet to Superheater ..	**205° F.**
„ „ Outlet from „ ..	**75° F.**

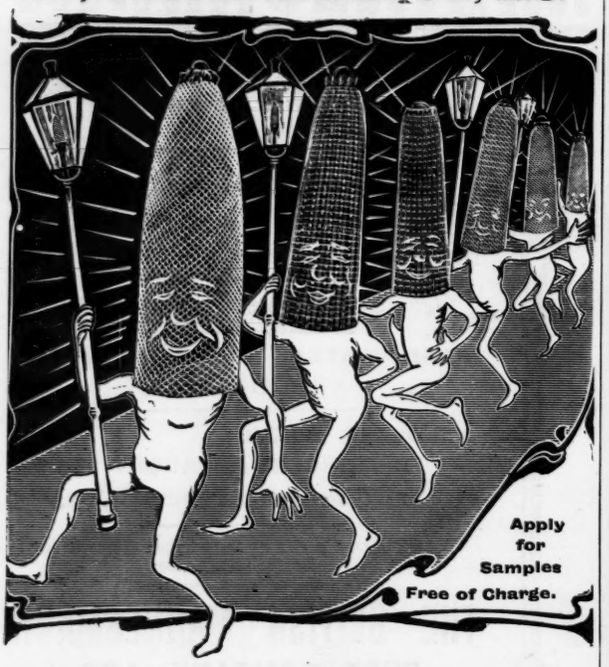
STEAM AND FUEL ARE SAVED;
THE CAPACITY OF THE PLANT IS INCREASED;
THE CHEAPEST UNREFINED ACID CAN BE USED AND LESS CONDENSING POWER IS REQUIRED.

PRICES AND PARTICULARS ON APPLICATION.

UNITED CHEMICAL WORKS,

JULIUS NORDEN & CO.

94, LEADENHALL ST., E.C.



INO MANTLES.

Registered in Great Britain, No. 244890.

THE

"NEW PLANET"

INVERTED LAMP.

FROM

2/-

Burner, Mantle, and Globe complete.

To the Trade only

Cheapest and most effective Burner made.

Genuine only if stamped "NEW PLANET."

PIFCO, LTD.,

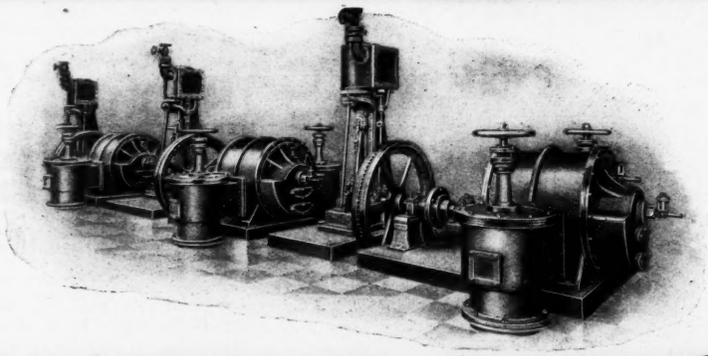
72-76, Duke St., Liverpool.

PIONEERS OF MODERN GAS LIGHTING.

R. LAIDLAW & SON,

LIMITED

GAS & WATER ENGINEERS.



THREE SETS OF VERTICAL STEAM ENGINE & EXHAUSTER TOTAL CAPACITY 210000 CUB. FT. OF GAS PER HOUR AT 60 REVS PER MINUTE SUPPLIED & ERECTED AT PORTSEA GAS WORKS.

SIMON SQUARE · WORKS · EDINBURGH

6 LITTLE BUSH · LANE · LONDON, E.C.

ALLIANCE FOUNDRY & GLASGOW. ENGINEERING WORKS.

Printed for WALTER KING by King, Sell, & Olding, Ltd.; and published by him at 11, BOLT COURT, FLEET STREET, in the CITY OF LONDON.—Tuesday, Nov. 21, 1905.